

DONORS

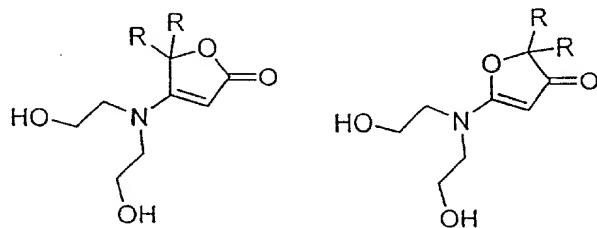
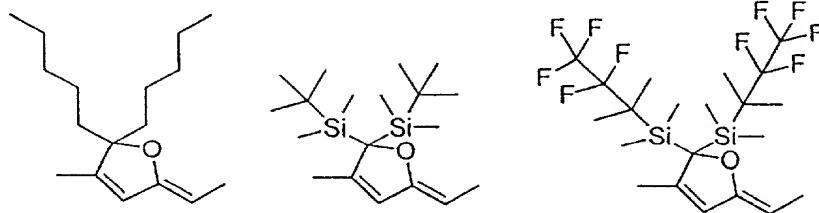


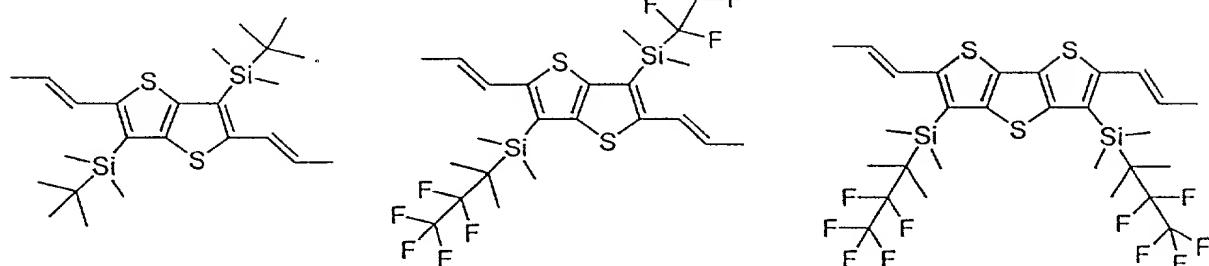
FIGURE 1

BRIDGES

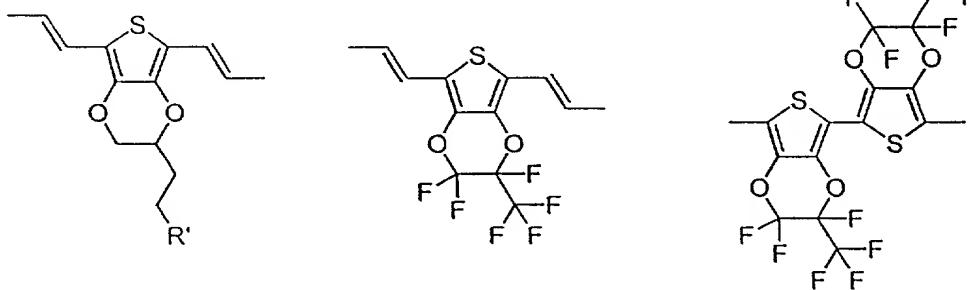
1. Polyene Examples



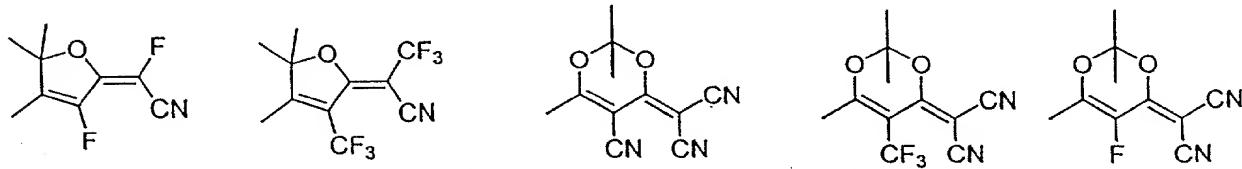
2. Fused Thiophene Examples



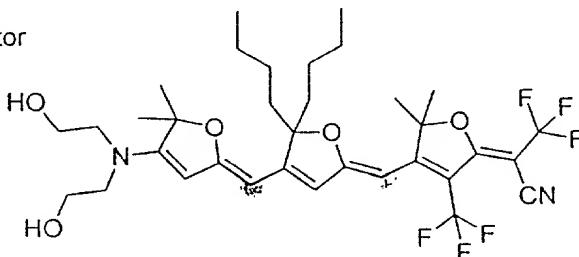
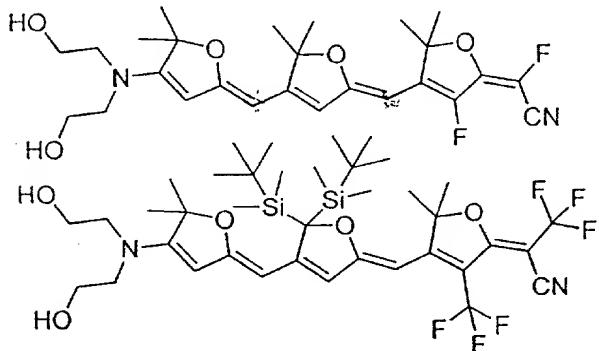
3. Monothiophene Examples



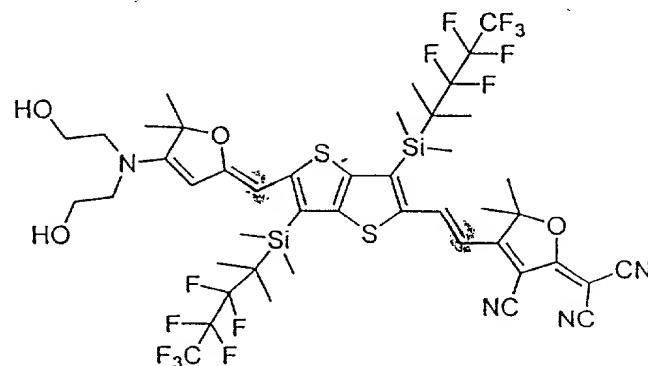
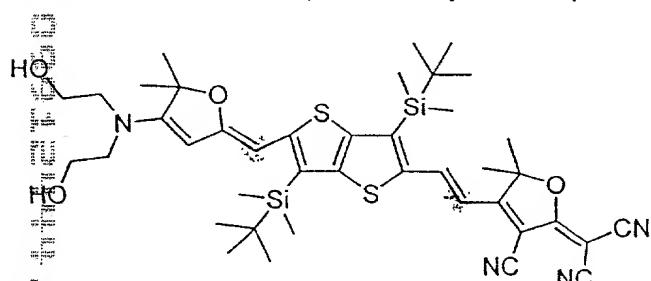
ACCEPTORS



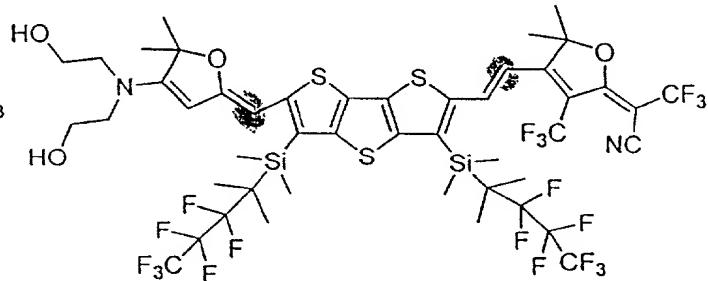
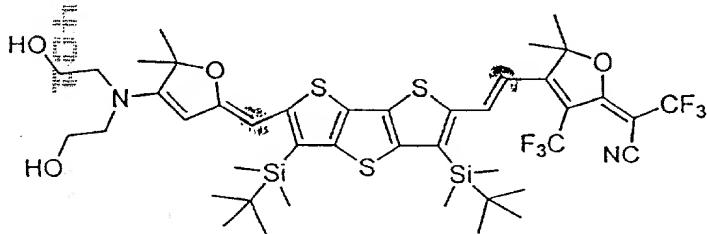
1). Polyene Donor + Polyene Bridge + Polyene Acceptor



2). Polyene Donor + dithiophene + Polyene Acceptor



3). Polyene Donor + tri-thiophene bridge + Polyene Acceptor



4). polyene Donor + thiophene + Polyene Acceptor

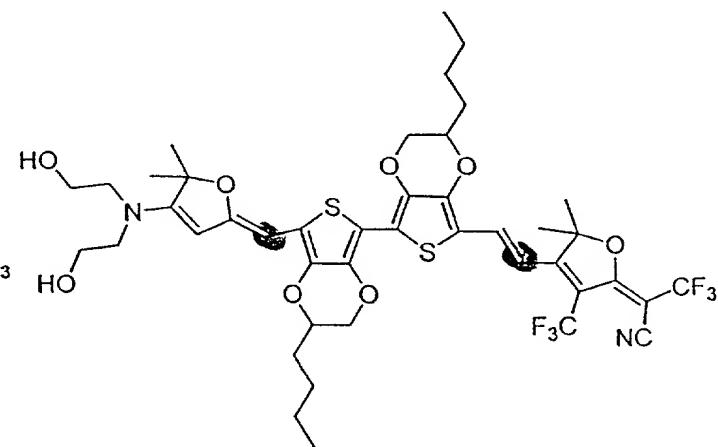
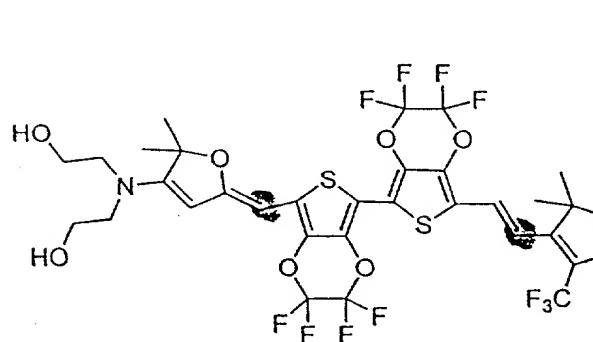
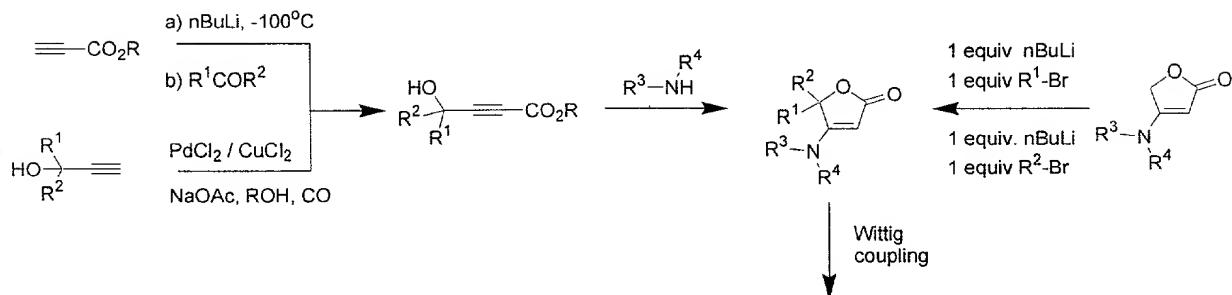
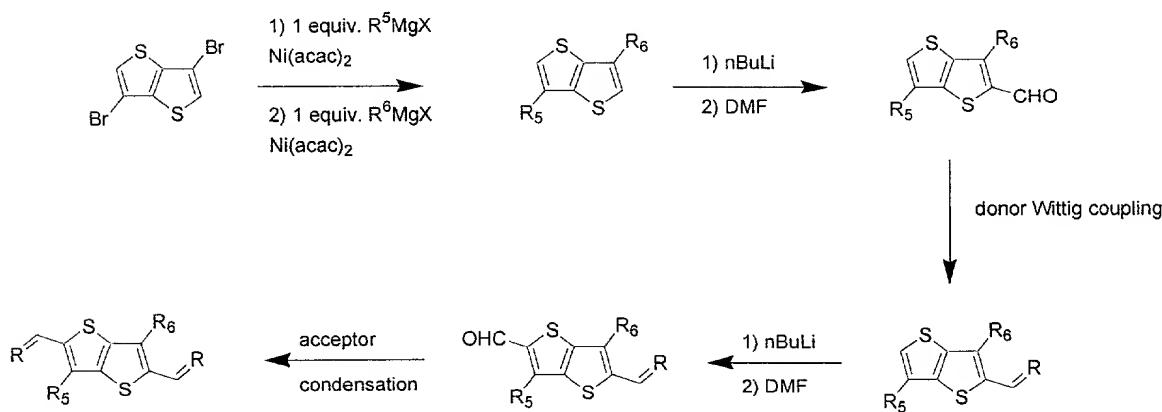


FIGURE 2



Tet. Lett. 1987, 28, 1857
 J. Am. Chem. Soc. 1986, 108, 800
 J. Org. Chem. 1987, 52, 2378
 Chem. Hetero. Cmpds. (NY) 2000 35(10) 1150
 Synthesis 1977, 12, 869
 Mendel. Comm. 2001, 1, 17
 Tet. Lett. 1988, 29(13), 1489

FIGURE 3



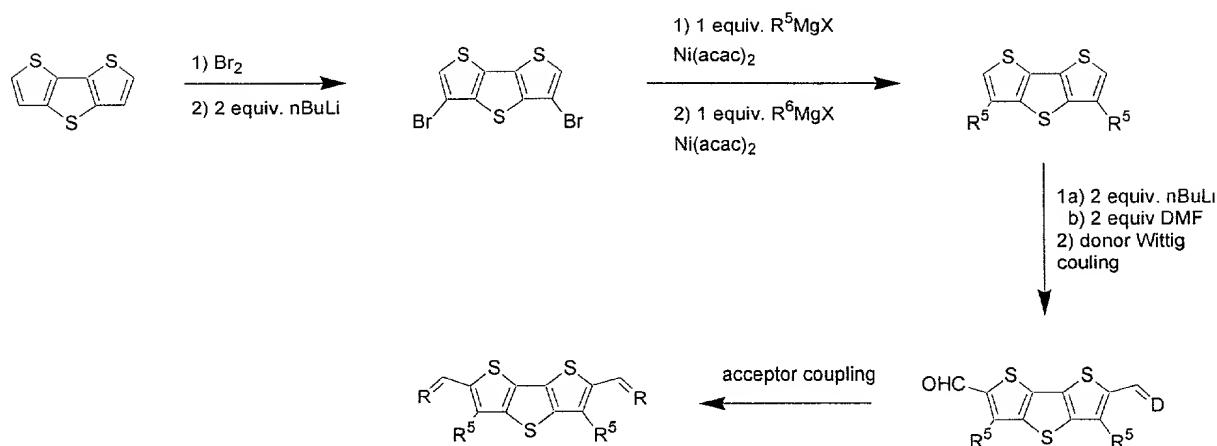
J. Chem. Soc. Perk. Trans. 1 1997, 22, 3465
 Heterocycles 1994, 38(1), 143
 J. Organomet. Chem. 1973, 50, C12
 Pure Appl. Chem. 1980, 52, 669
 Tet. Lett. 1981, 22, 4449

FIGURE 4

Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES

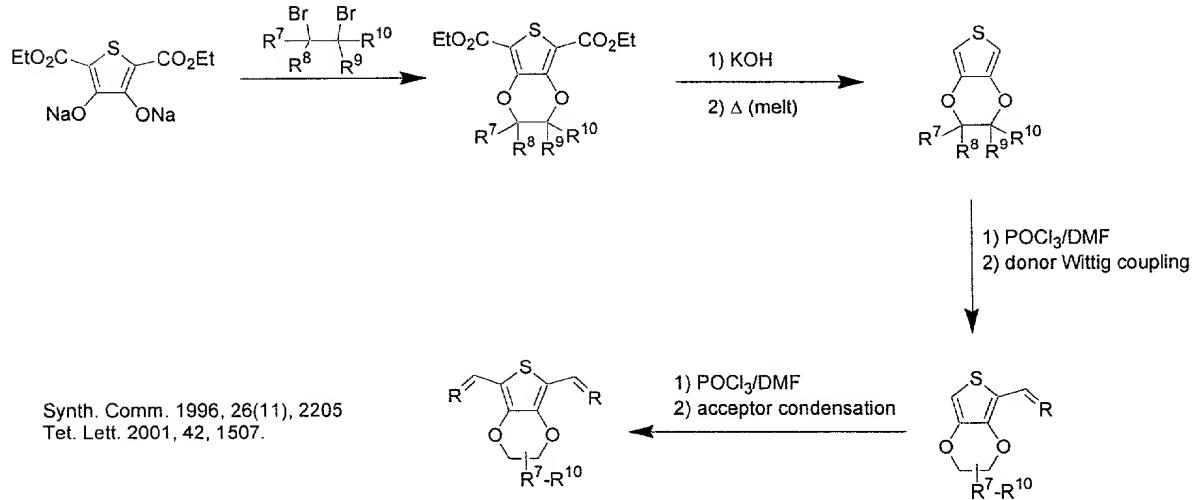
Inventors: L.R. Dalton et al.

Docket No.: UOFW117403



J. Org. Chem. 1971, 36(12), 1645
J. Chem. Soc. Perk. Trans. 2 1992, 5, 765
J. Mater. Chem. 1999, 9(9), 2227

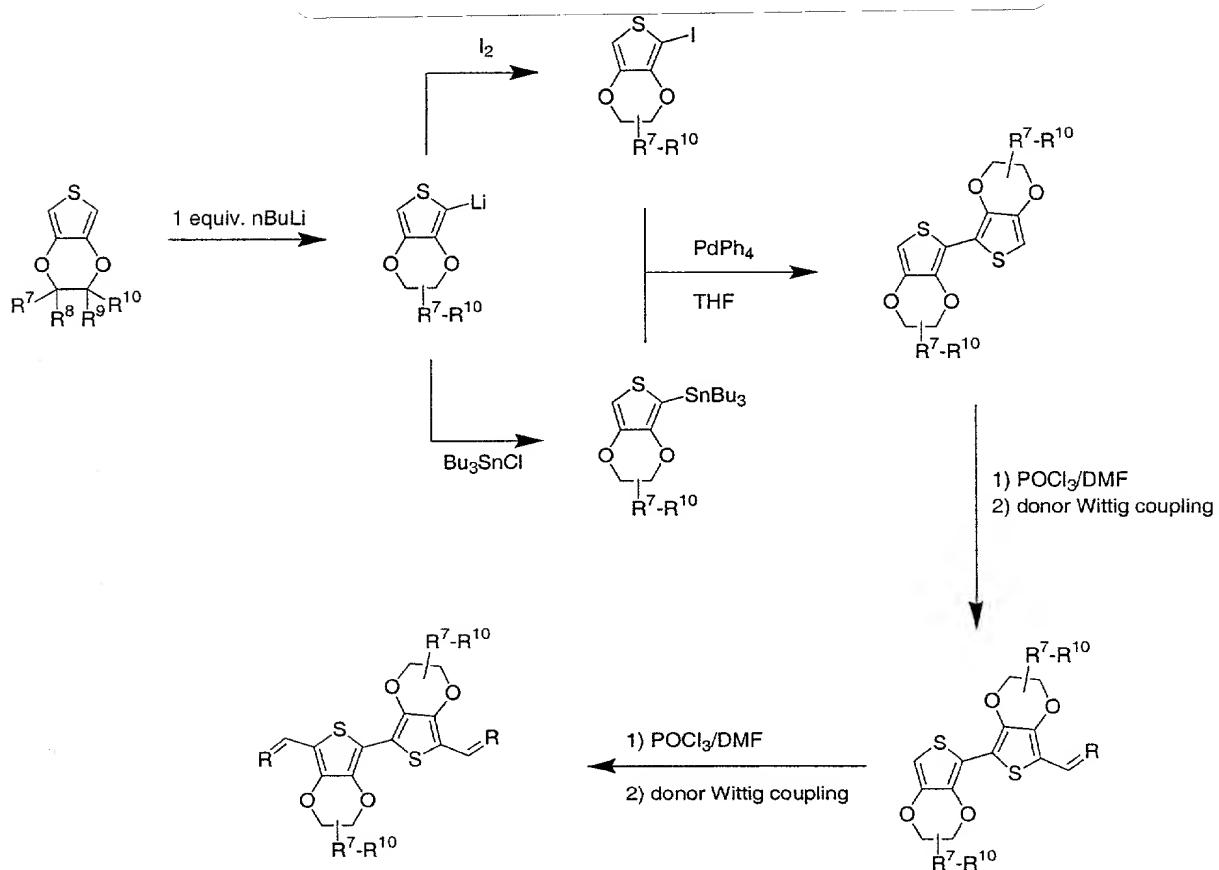
FIGURE 5



Synth. Comm. 1996, 26(11), 2205
Tet. Lett. 2001, 42, 1507.

FIGURE 6

Title: HYPERPOLARIZABLE ORGANIC CHROMOPHORES
Inventors: L.R. Dalton et al.
Docket No.: UOFW117403



J. Am. Chem. Soc. 2001, 123(19), 4643
Chem. Mater. 1996, 8(11), 2659
J. Chem. Soc. Perkins Trans. I 1997, 1957

FIGURE 7

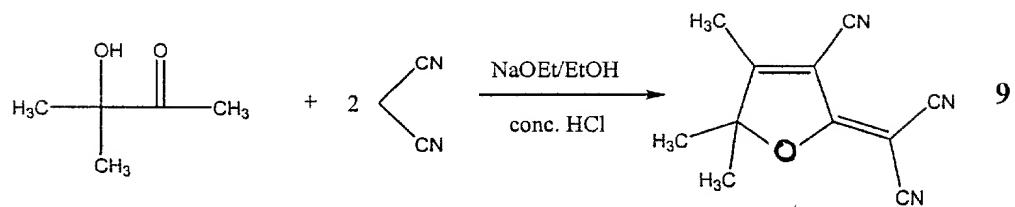


FIGURE 11

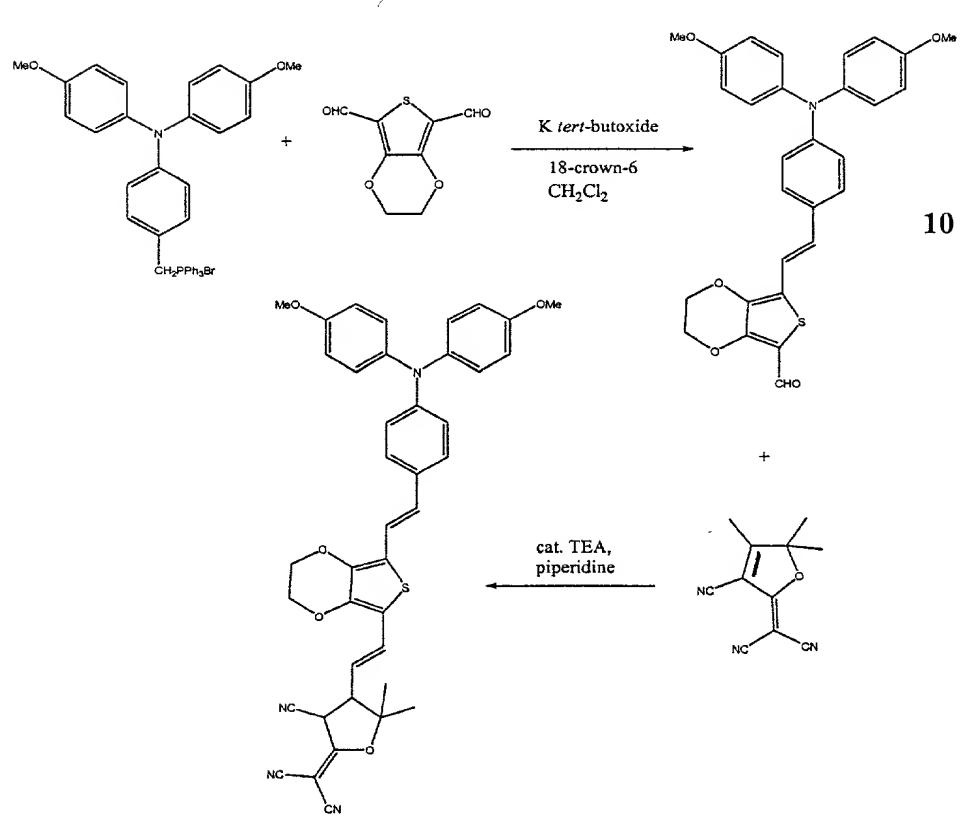


FIGURE 8

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Inventors: L.R. Dalton et al.
Docket No.: UOFW117403

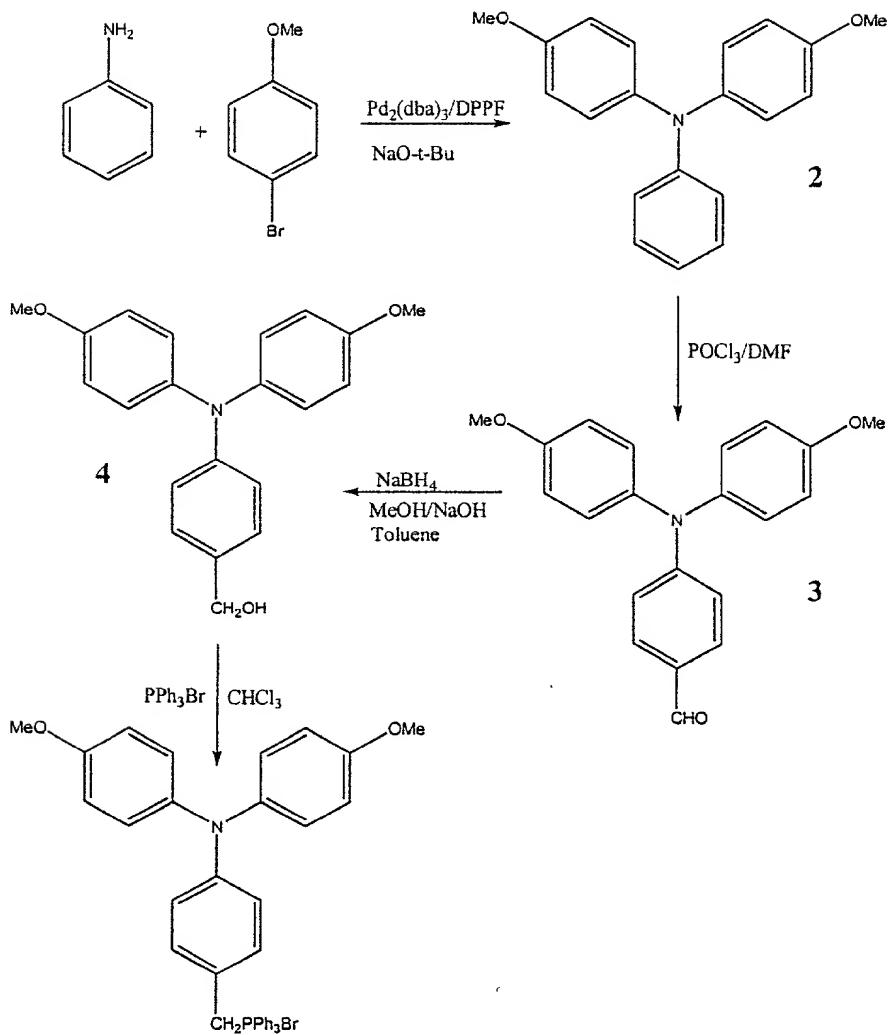


FIGURE 9

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Inventors: L.R. Dalton et al.
Docket No.: UOFW117403

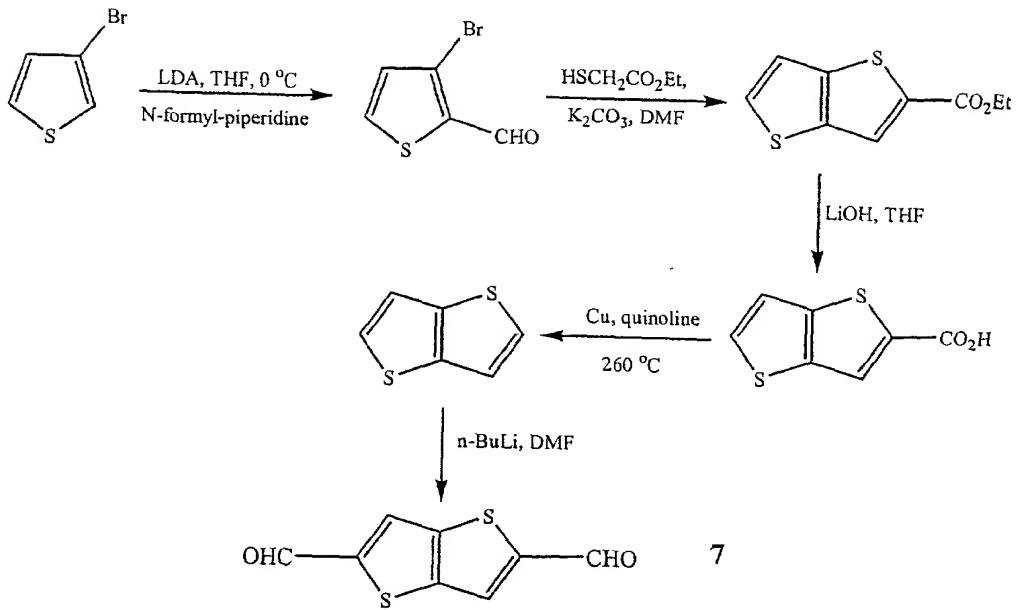


FIGURE 13

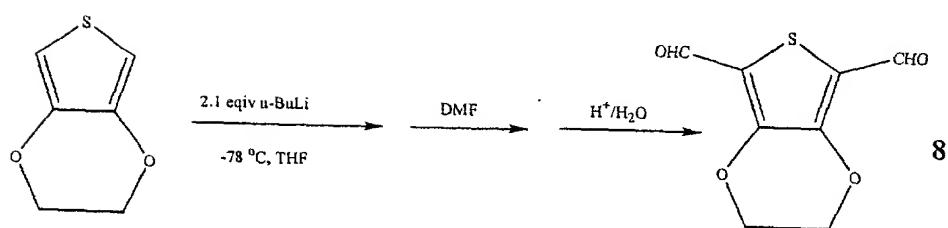


FIGURE 10

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Inventors: L.R. Dalton et al.

Docket No.: UO FW117403

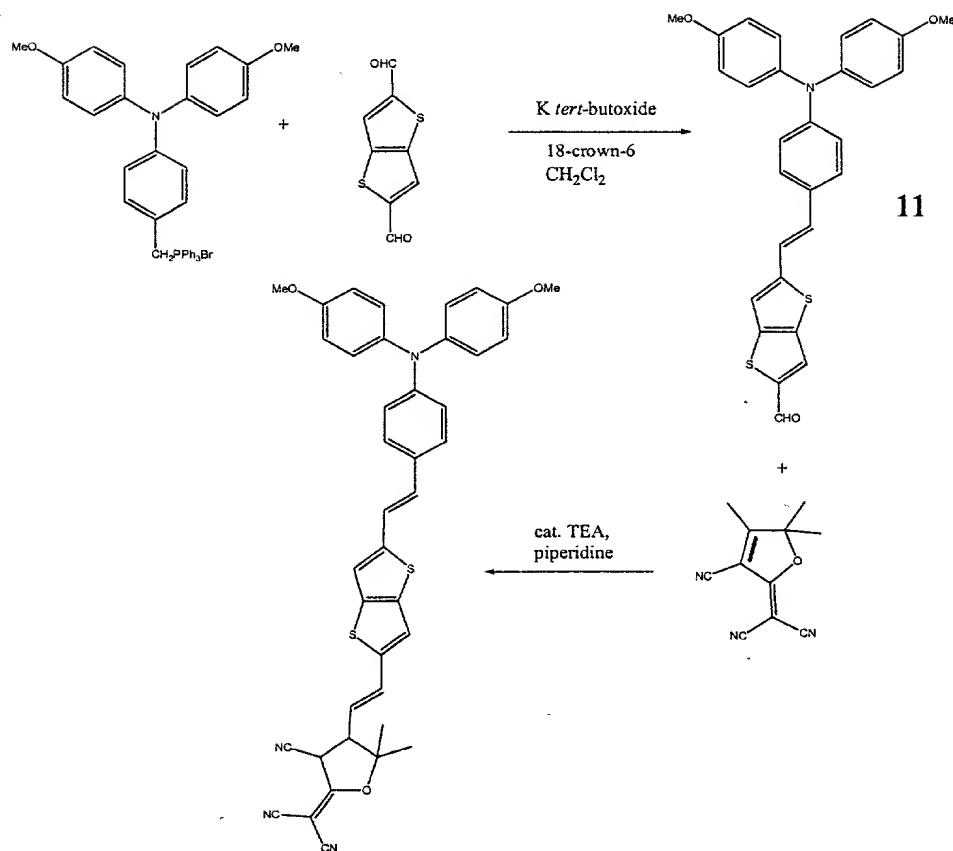


FIGURE 12

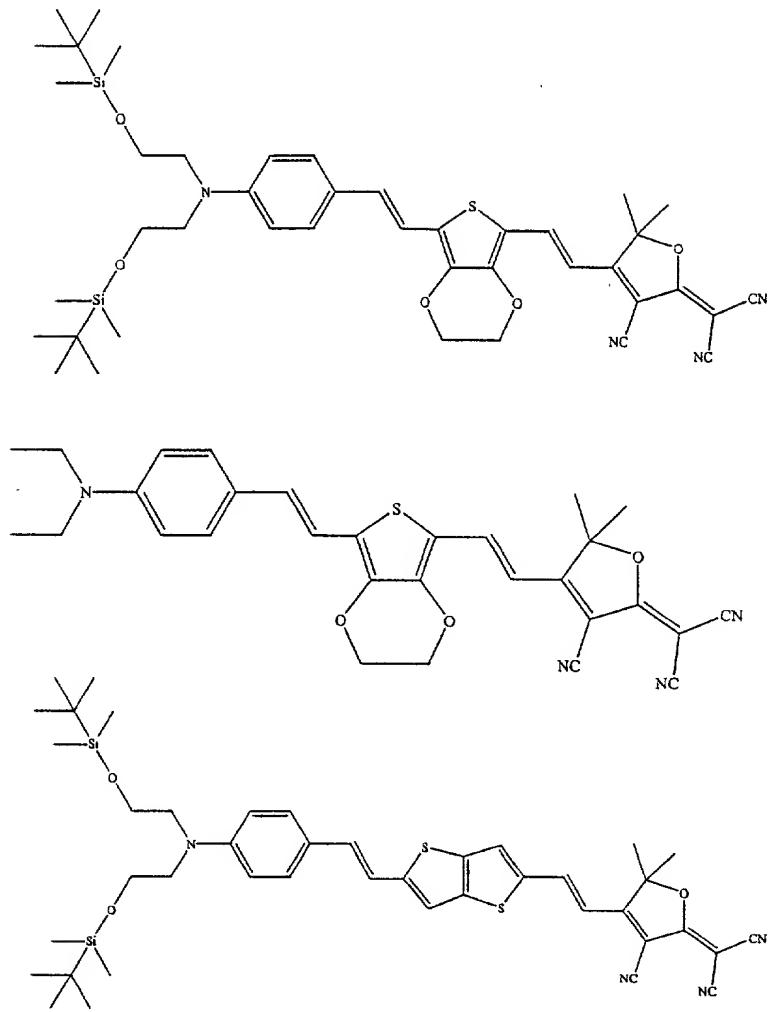


FIGURE 14

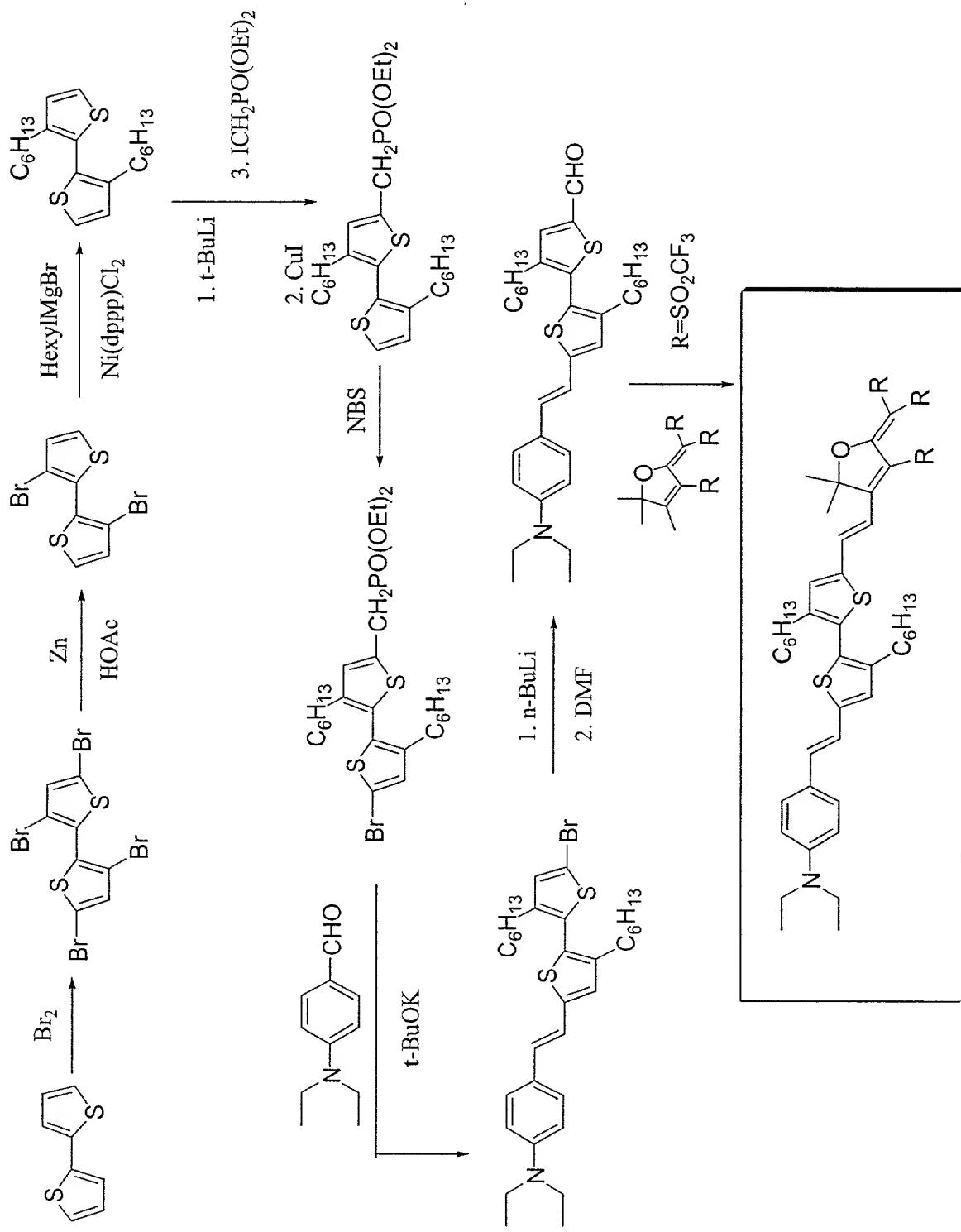


FIGURE 15

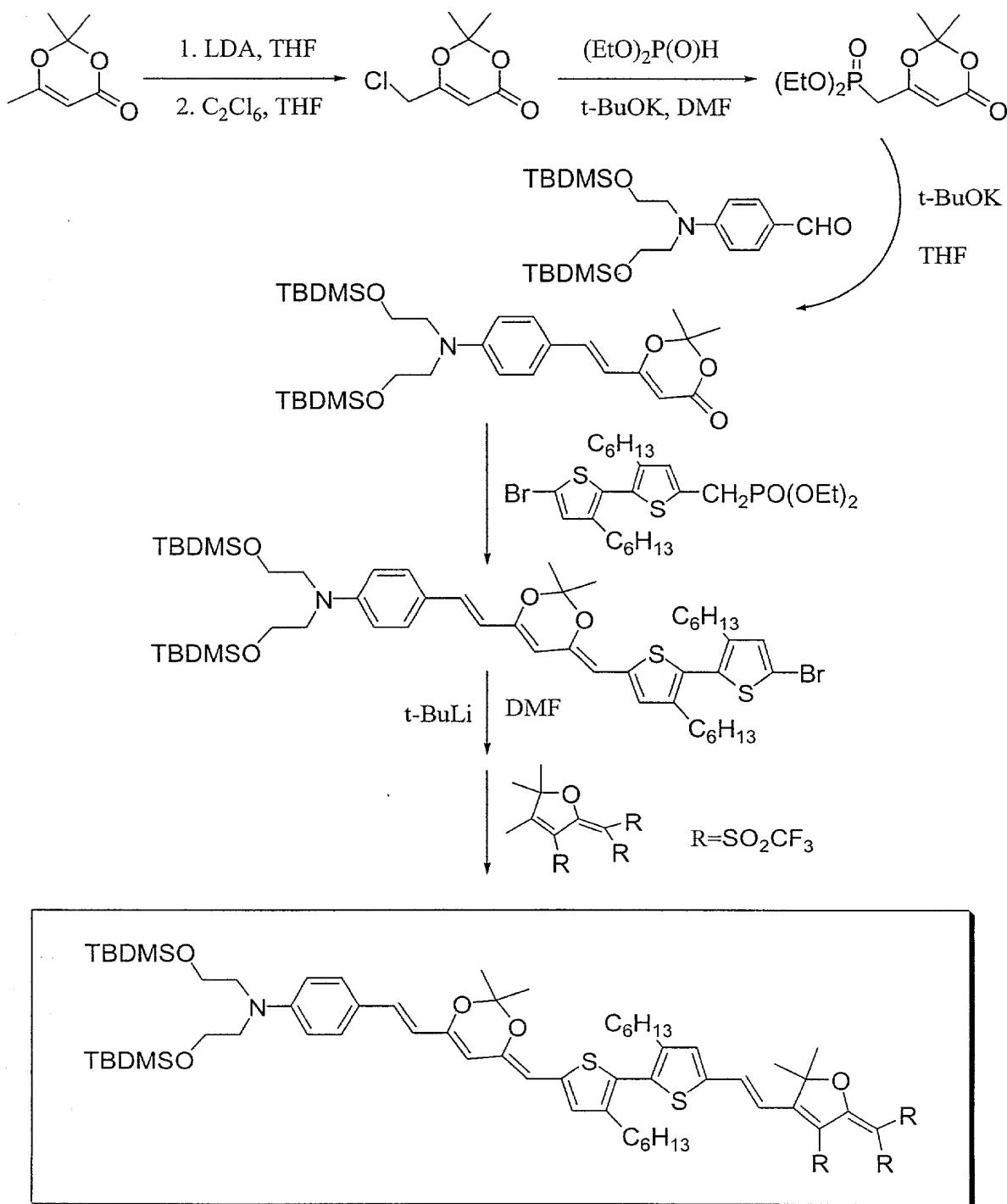


FIGURE 17

EO coef. vs. chromophore loading

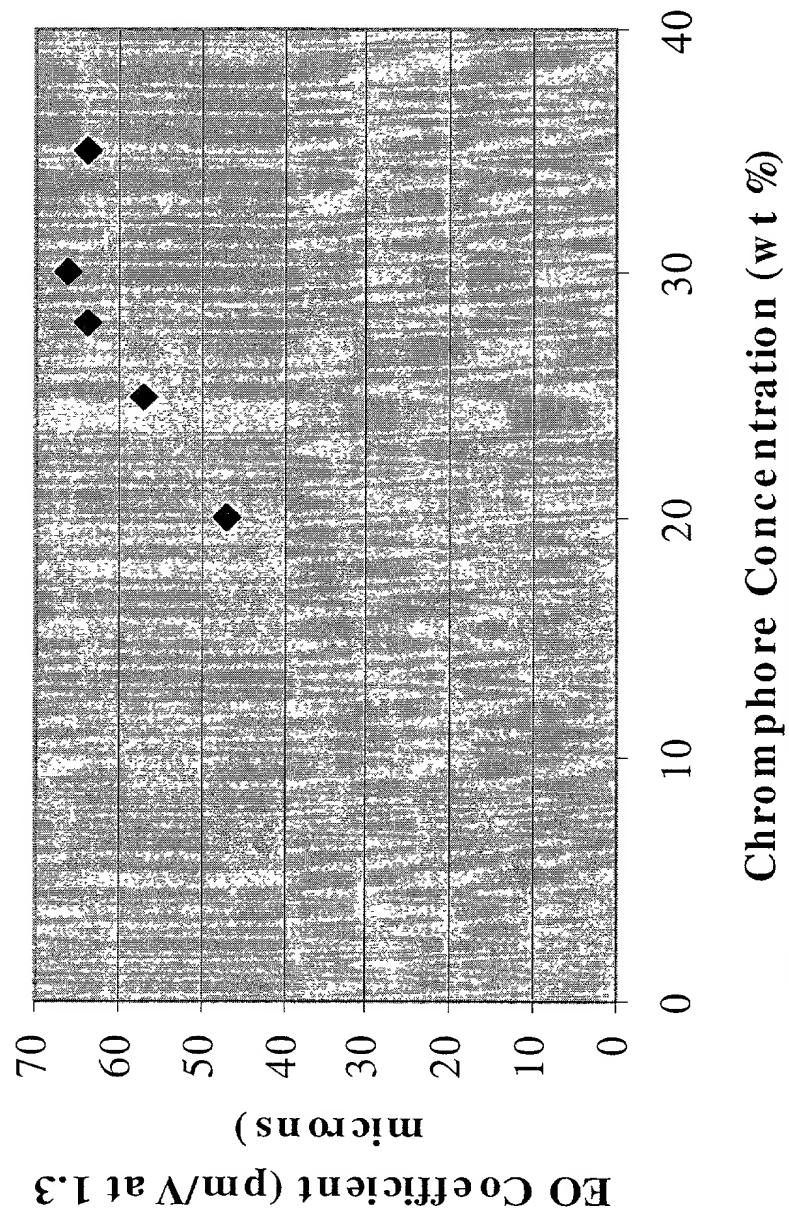


FIGURE 18

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Inventors: L.R. Dalton et al.
Docket No.: UOFW117403

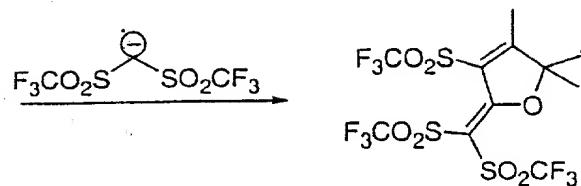
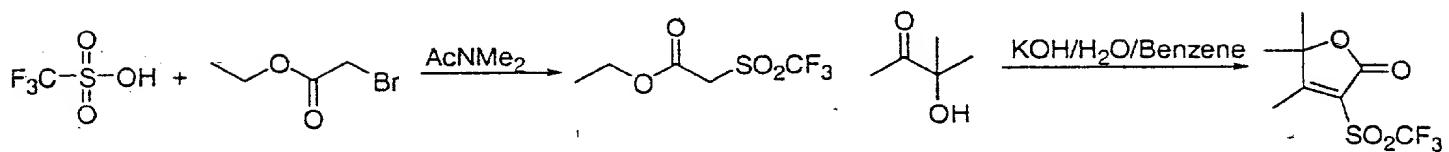


FIGURE 16

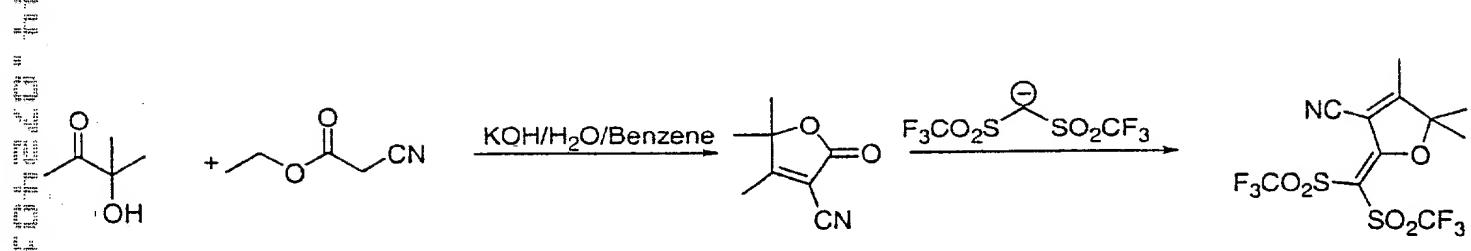


FIGURE 19

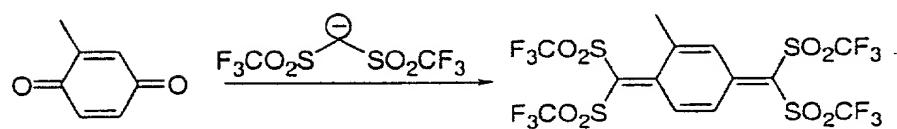


FIGURE 20

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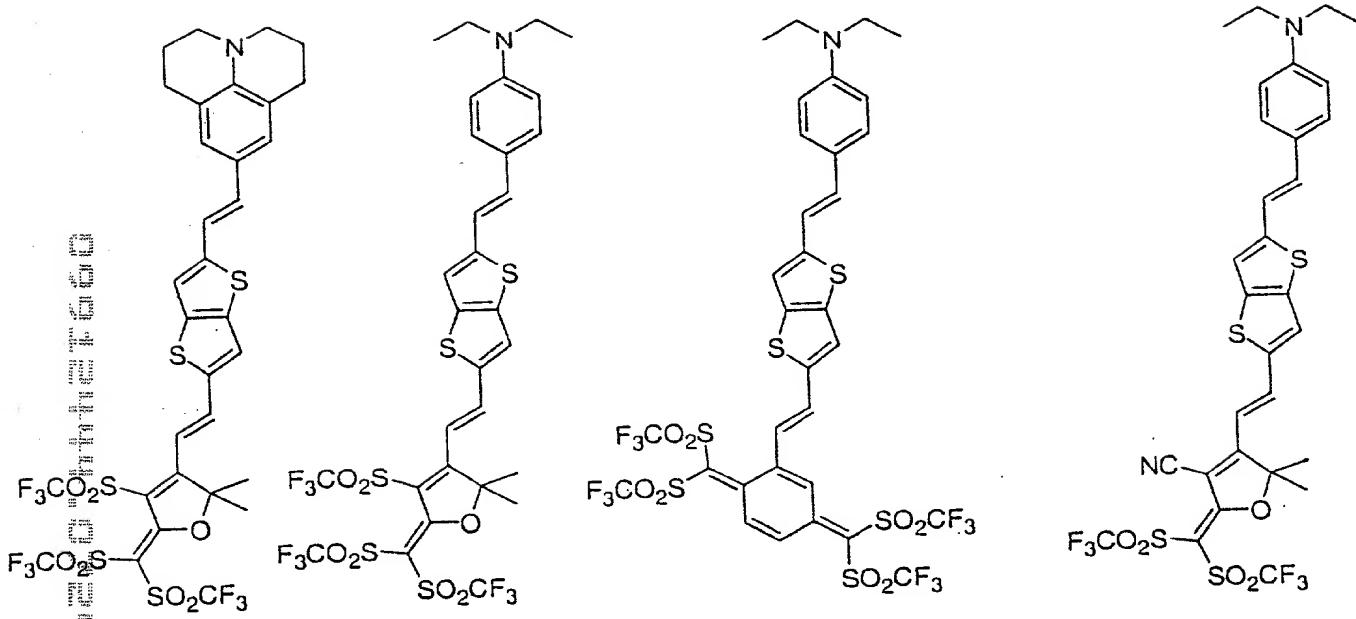


FIGURE 21

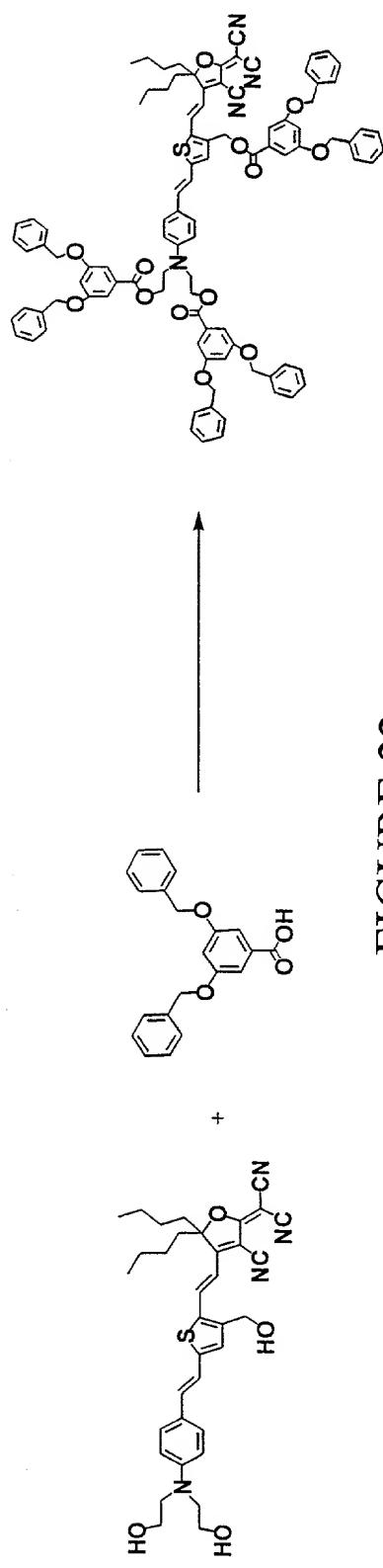


FIGURE 22

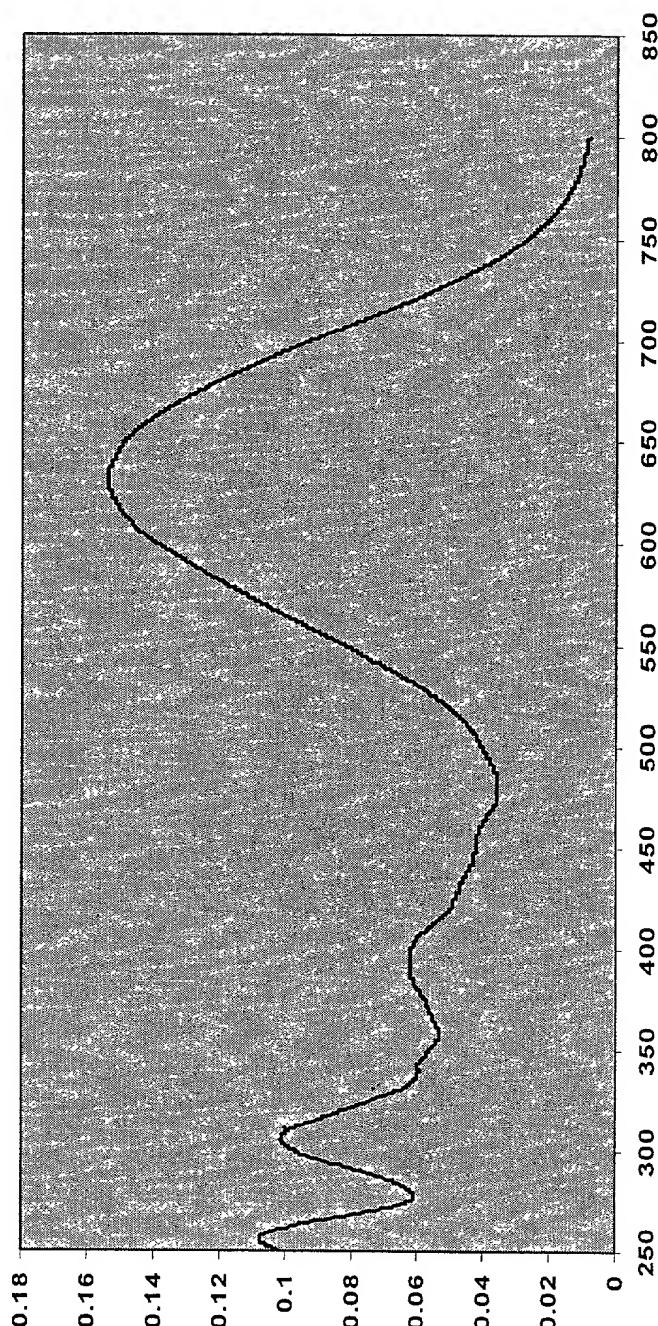


FIGURE 24

SCANNED, # 14

FIGURE 23

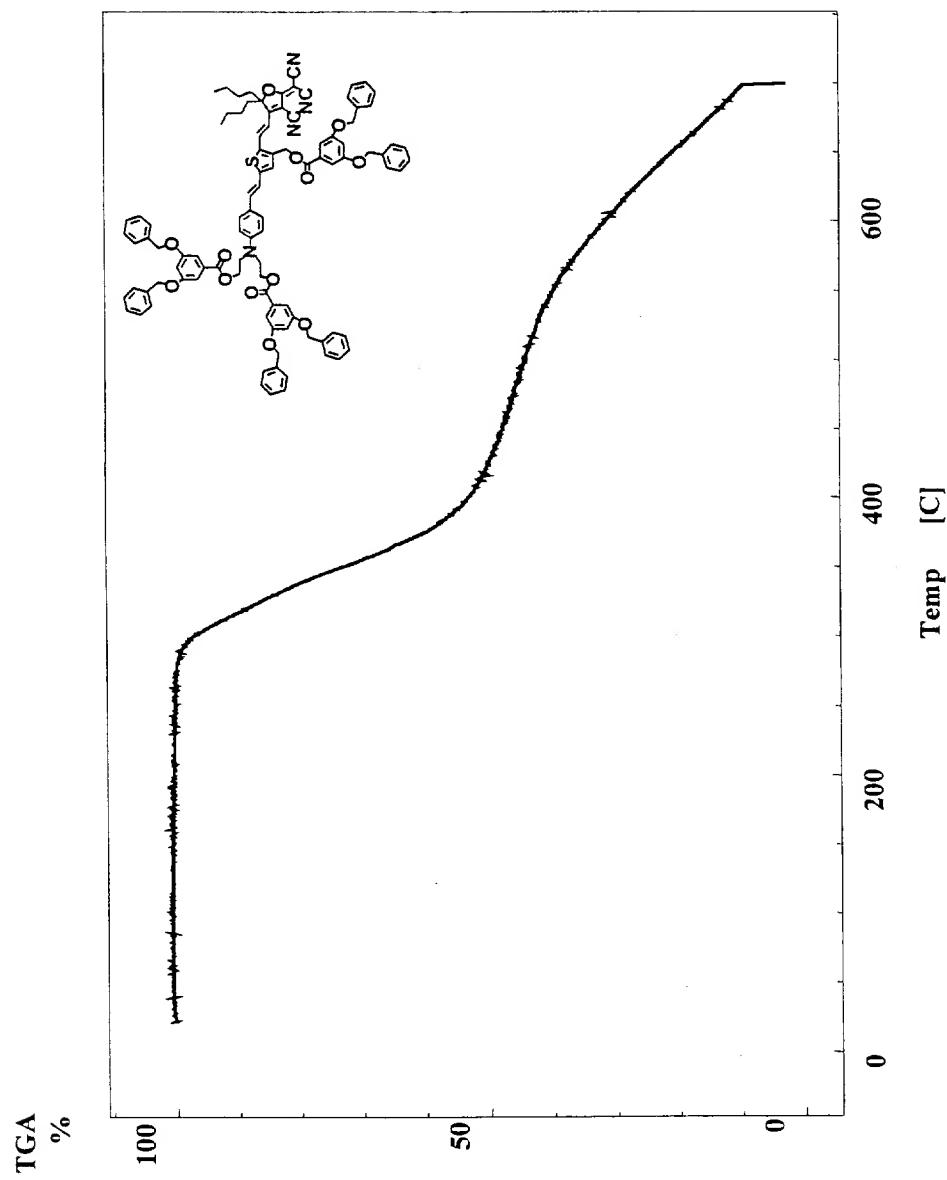
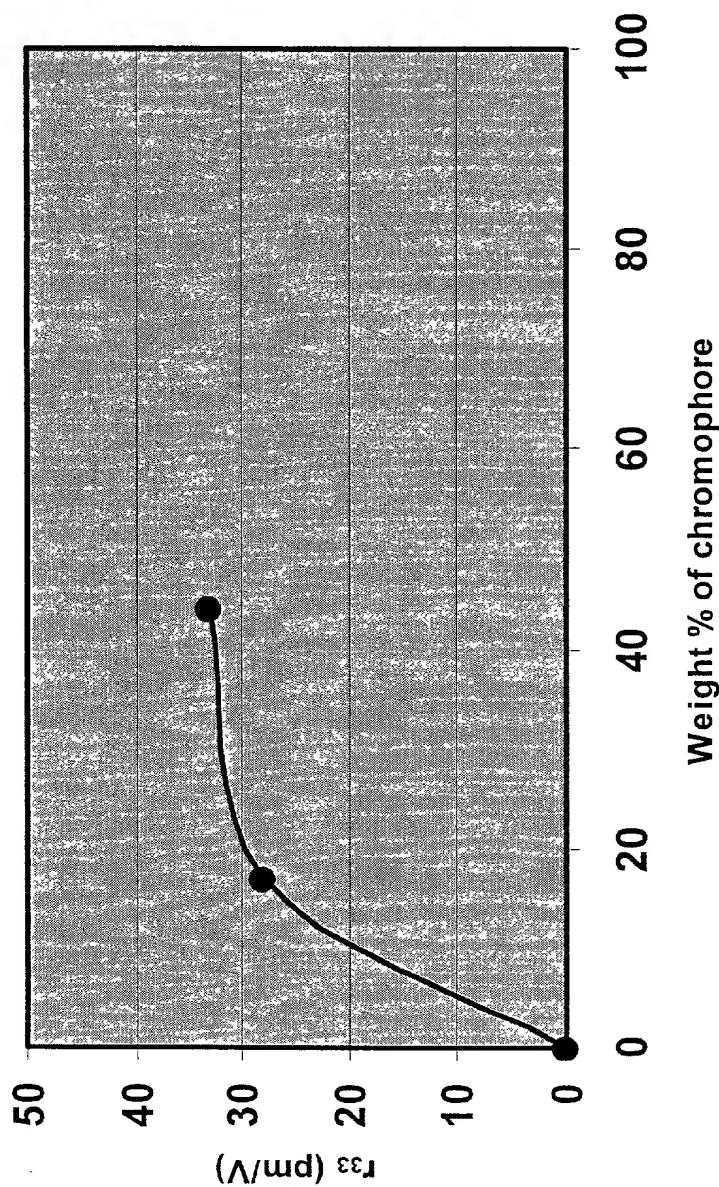


FIGURE 25

Electro-Optic Activity vs. Loading Density



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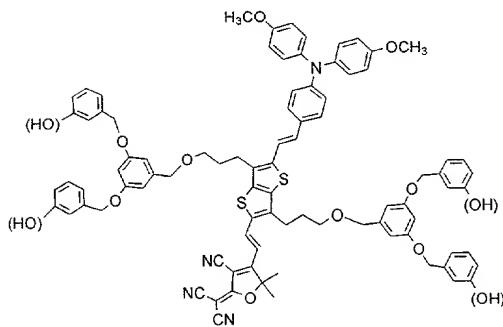


FIGURE 26

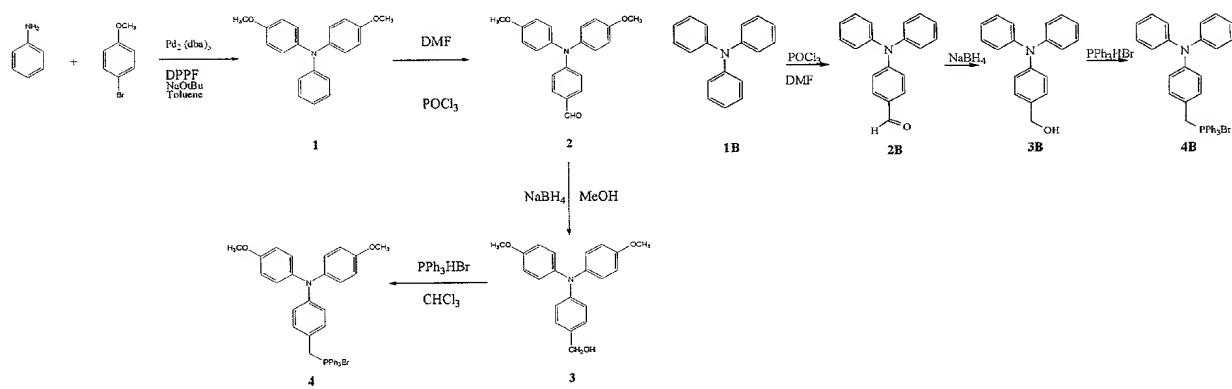


FIGURE 27

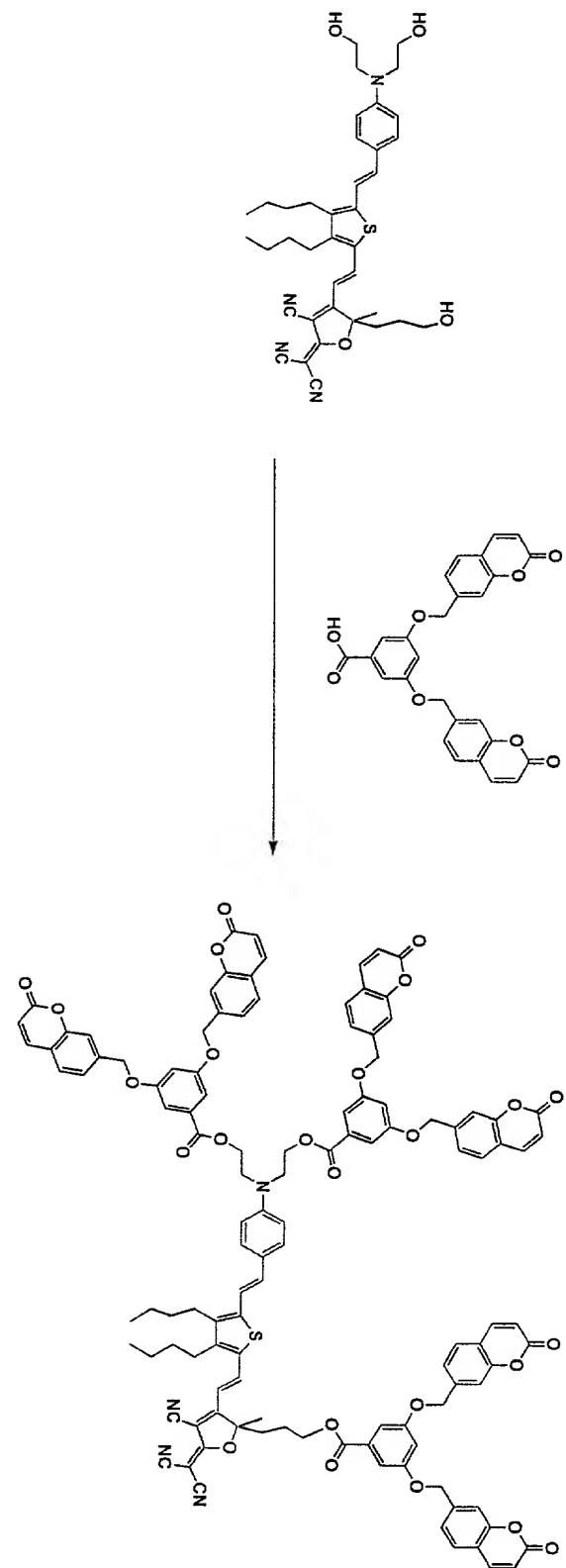


FIGURE 28

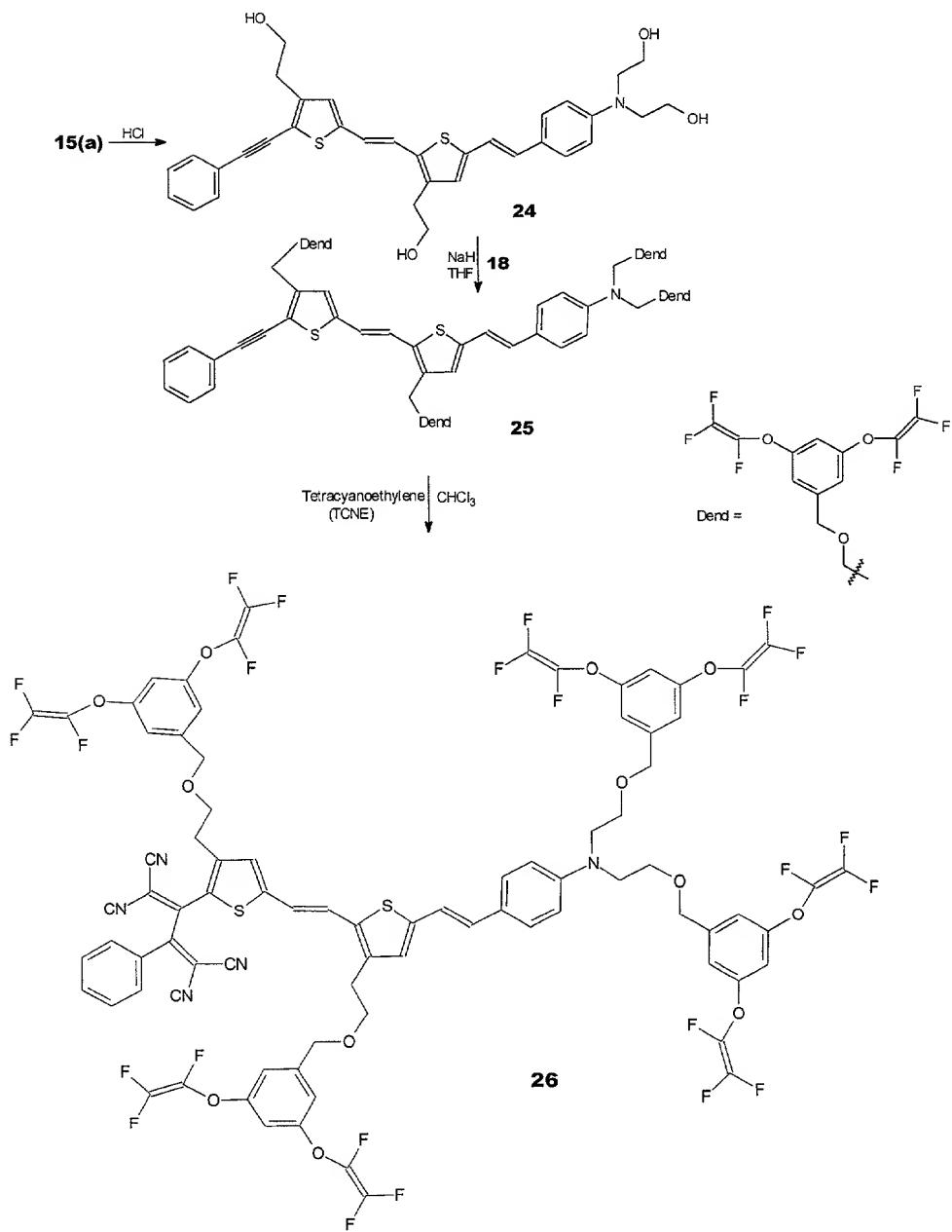


FIGURE 29

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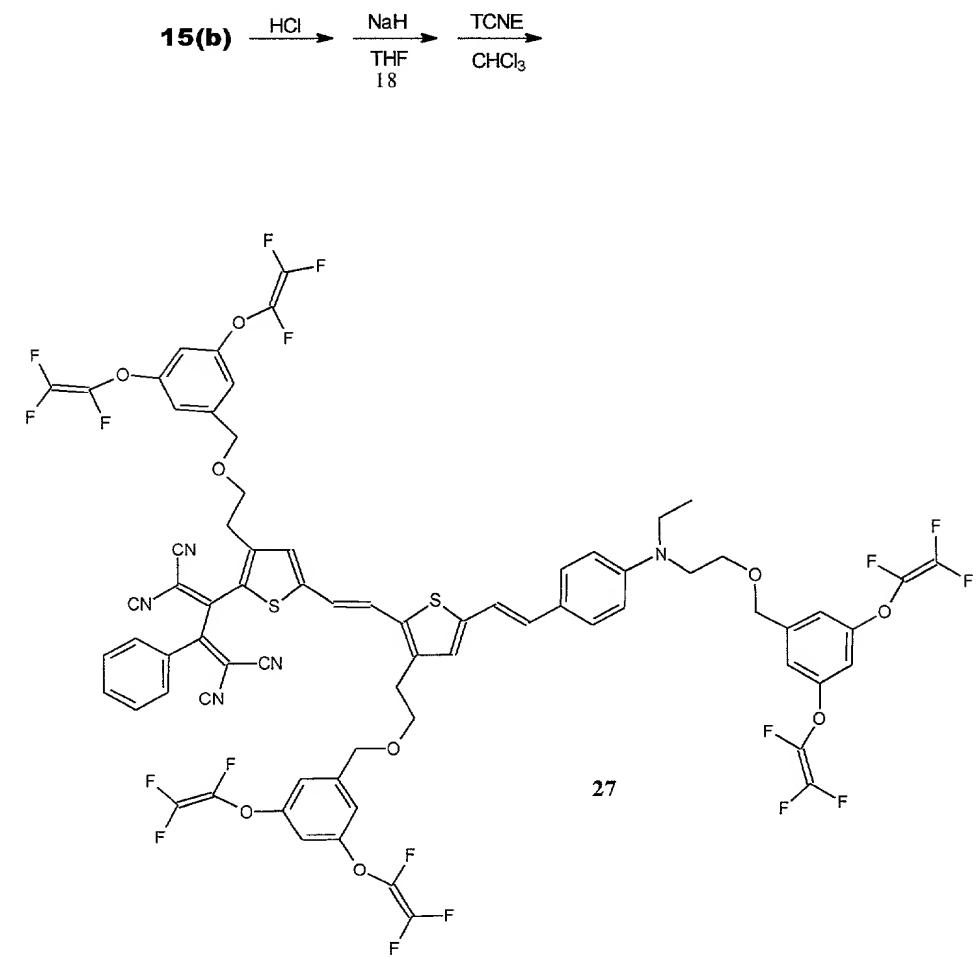


FIGURE 30

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Inventors: L.R. Dalton et al.
Docket No.: UO FWI 17403

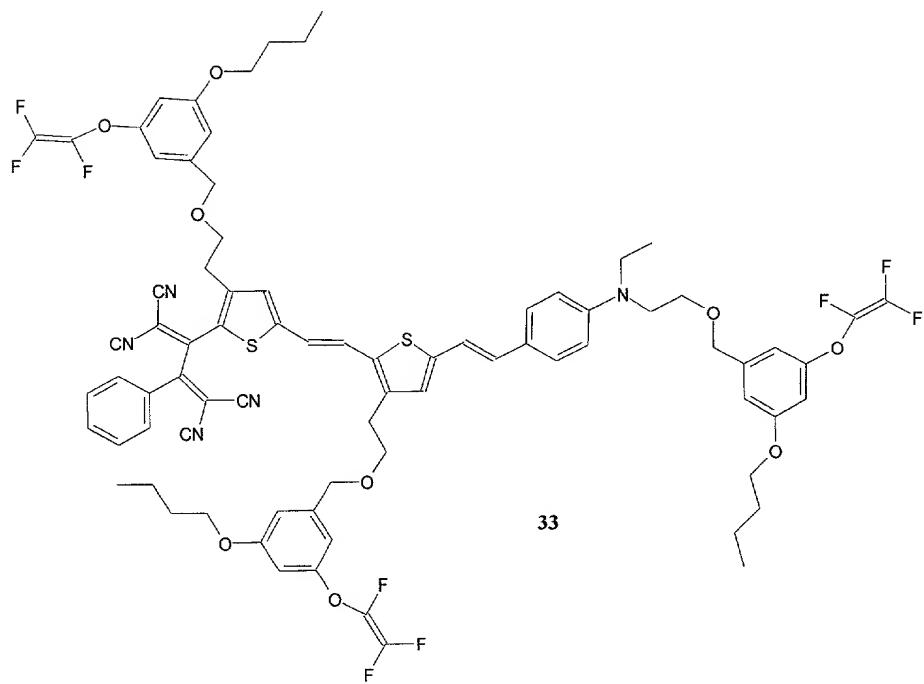
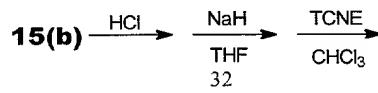


FIGURE 31

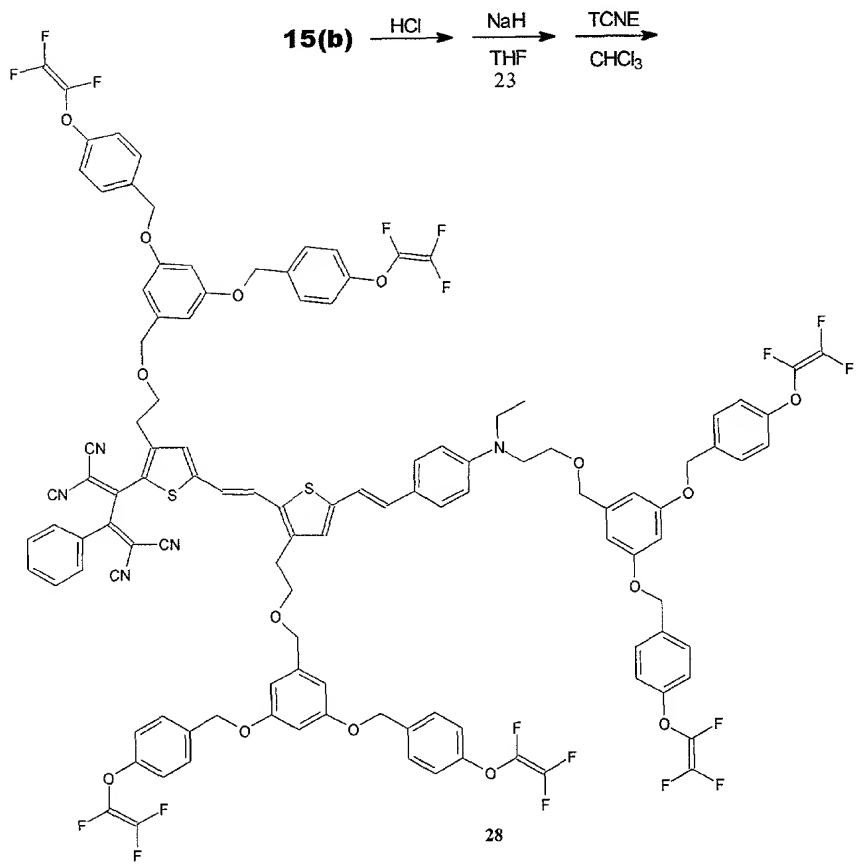


FIGURE 32

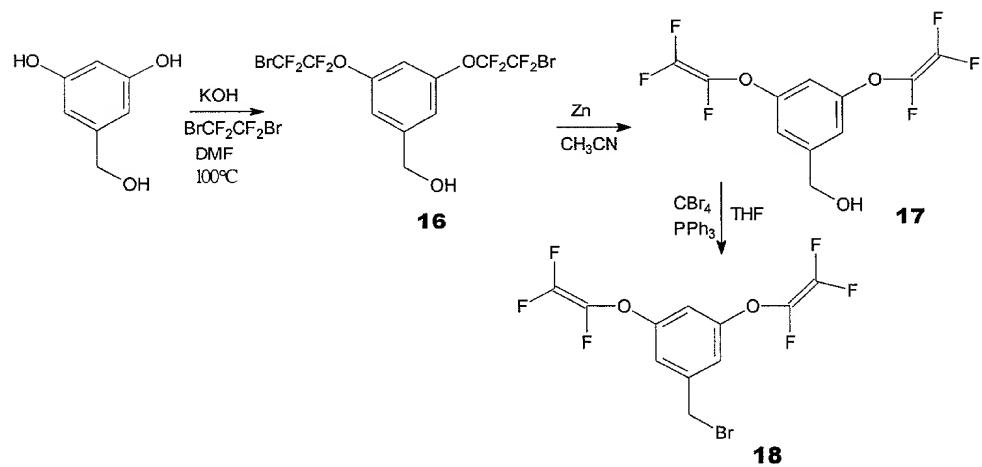


FIGURE 33

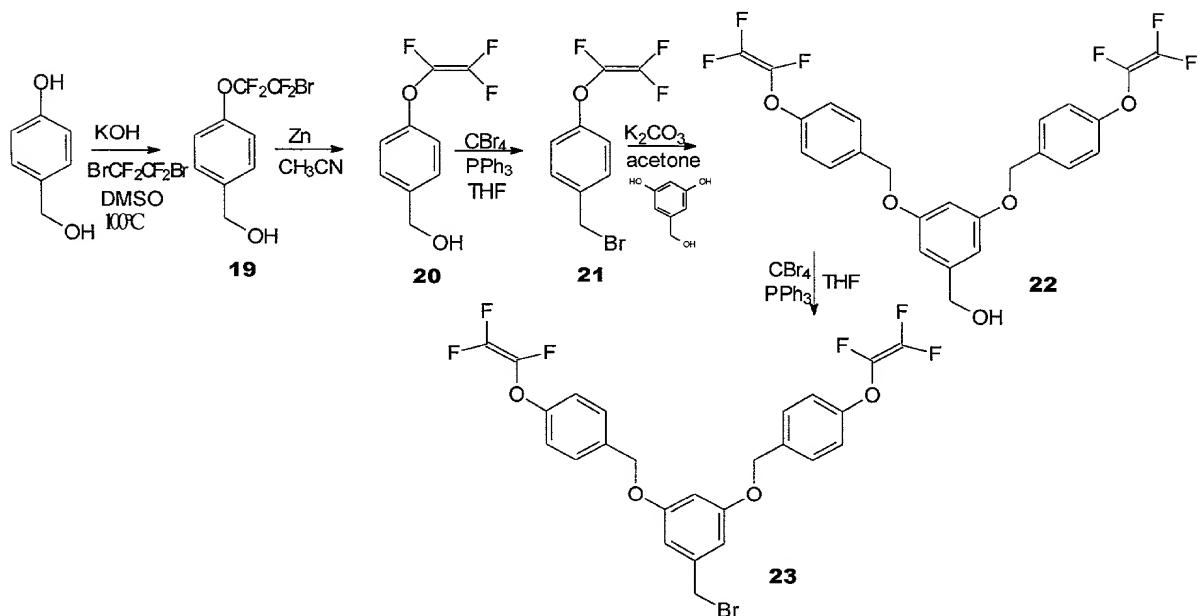


FIGURE 34

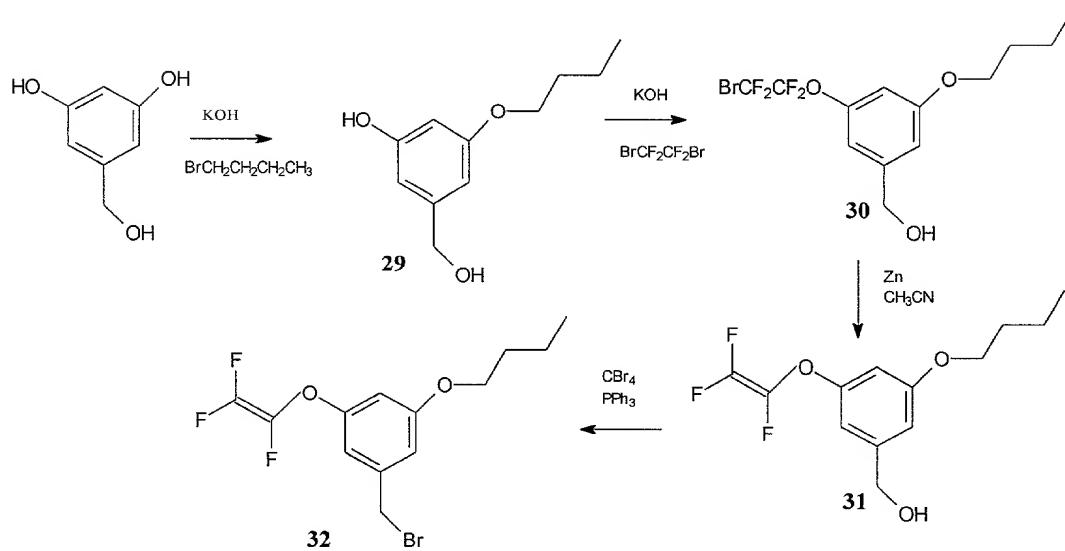


FIGURE 35

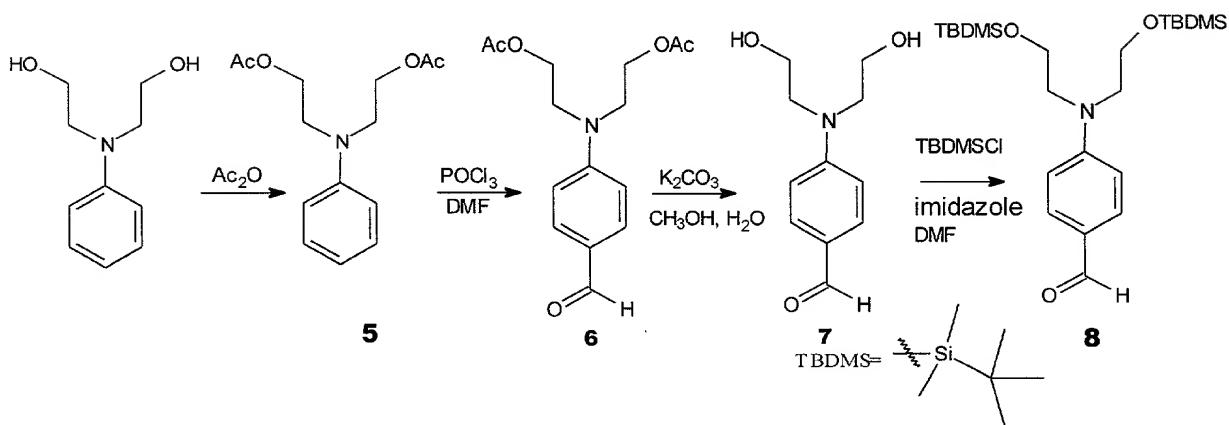


FIGURE 36

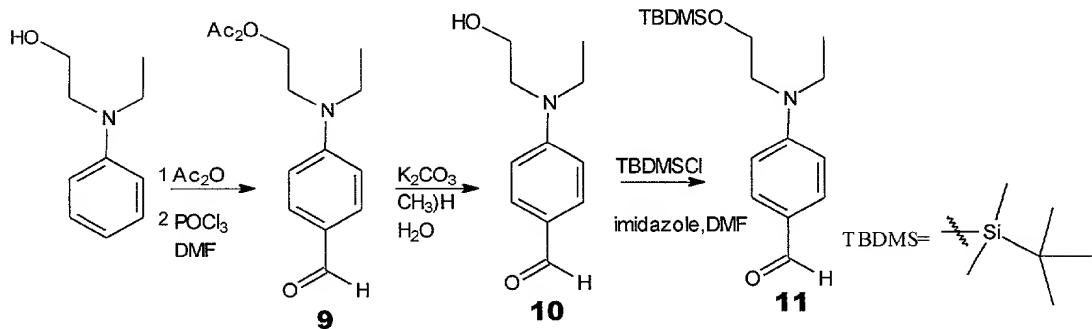
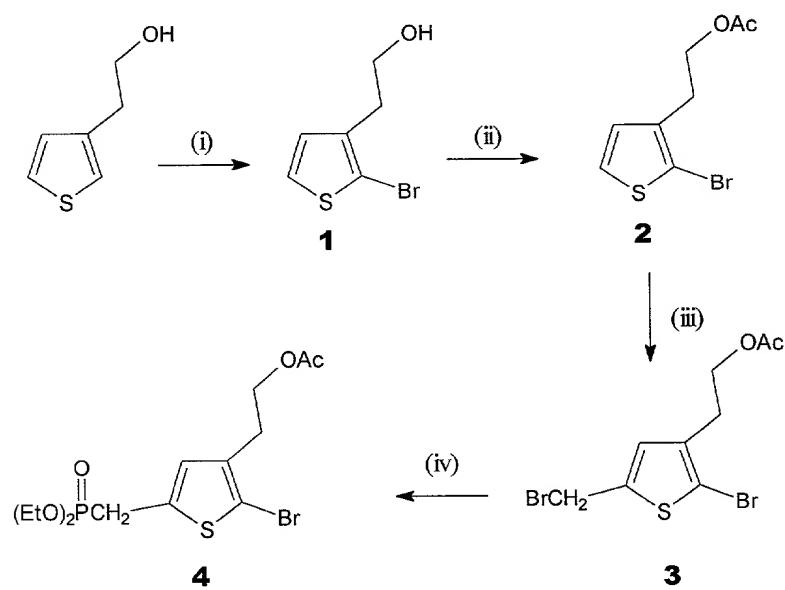


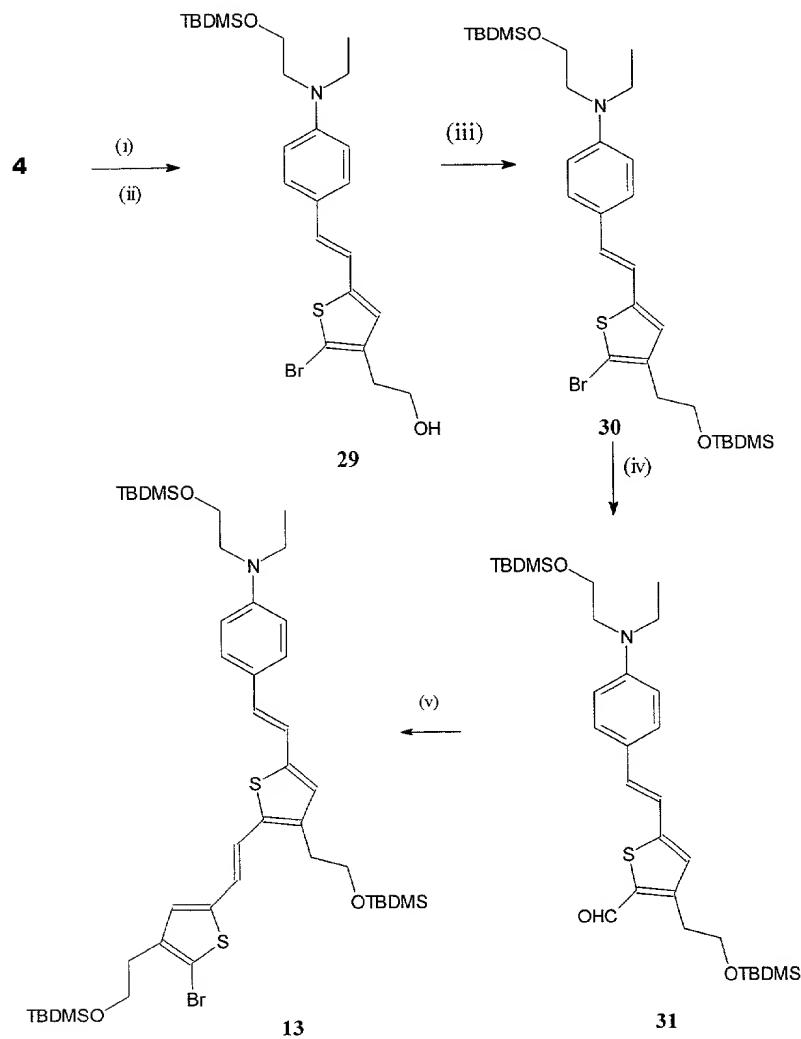
FIGURE 37



(i) NBS, DMF, RT; (ii) acetic anhydride, 60°C; (iii) (CH₂O)_n, 45% HBr/HOAc, HOAc, 50°C;

(iv) P(OEt)₃, DMF, 120°C.

FIGURE 38



(i) 11, KOtBu, THF, 0°C; (ii) K₂CO₃, CH₃OH, H₂O, RT; (iii) (CH₃)₃CSi(CH₃)₂Cl, imidazole, DMF, 50°C; (iv) a. nBu-Li, THF, -78°C; b. DMF, RT; (v) a. 4, KOtBu, THF, 0°C; b. K₂CO₃, CH₃OH, H₂O, RT; c. (CH₃)₃CSi(CH₃)₂Cl, imidazole, DMF, 50°C.

FIGURE 39

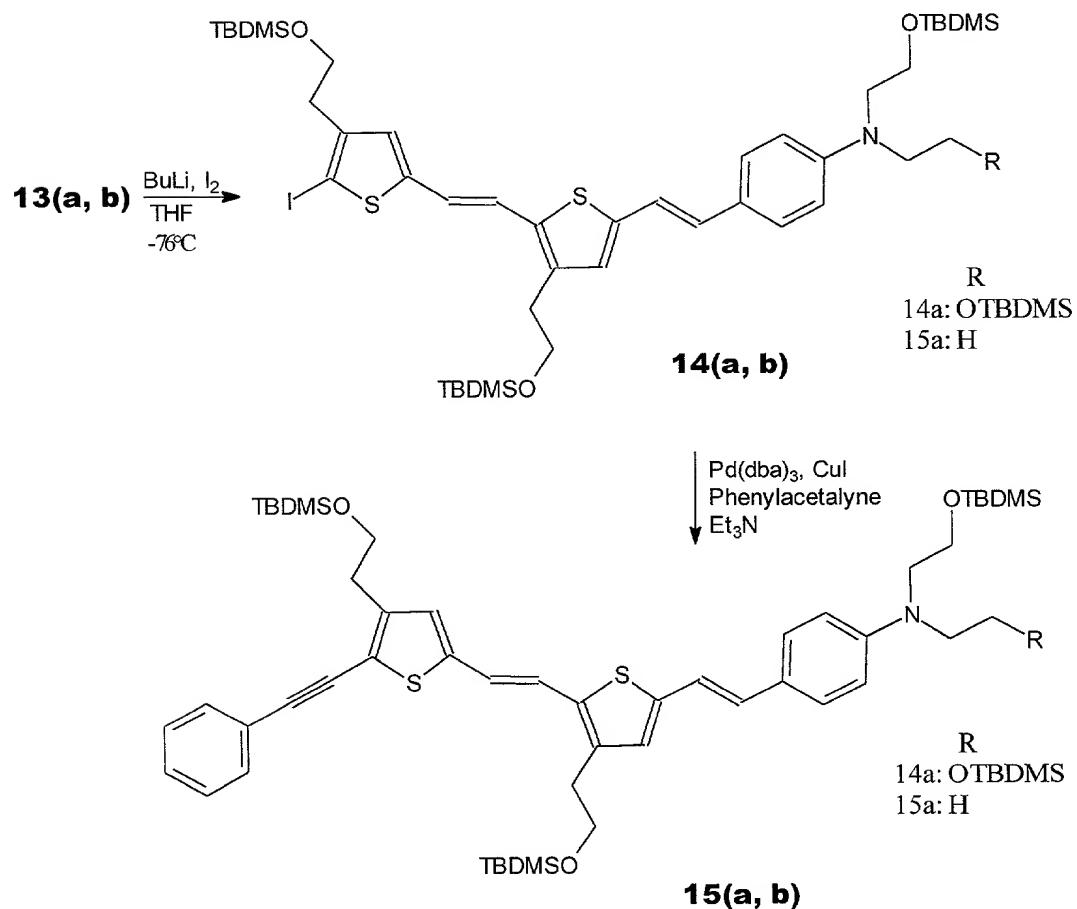
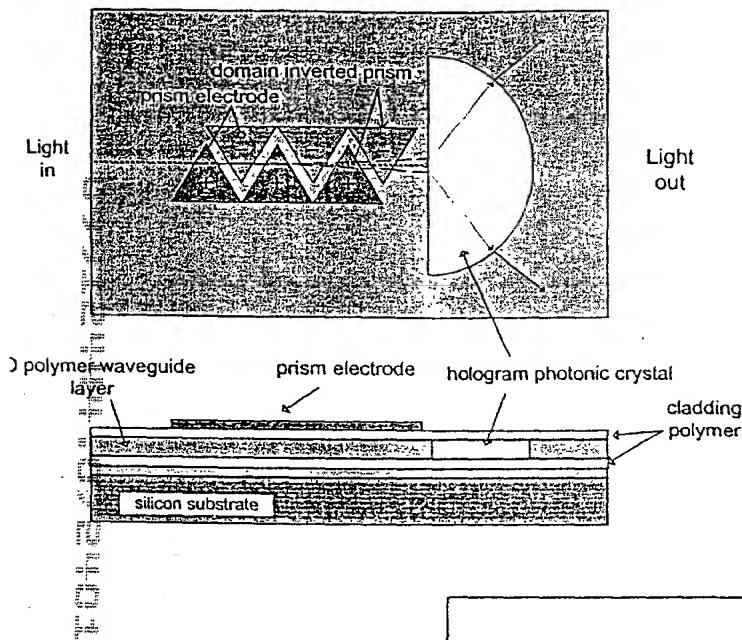


FIGURE 40

Large Angle Laser Beam Scanner



EO waveguide prism introduces a small deflection angle to initialize the beam scanning. The half-circle 2-D photonic crystal region is imbedded into the waveguide, so that the deflection angle is “amplified” as the light pass through the crystal region. 3D scanning can also be provided if a 3-D structure is built

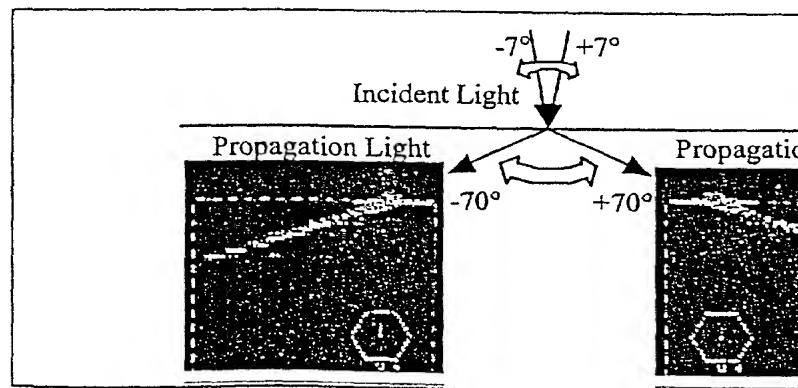
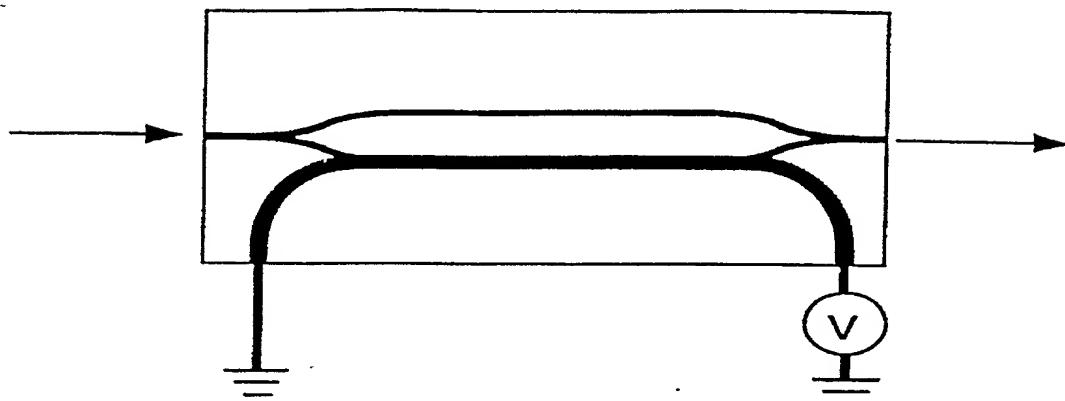
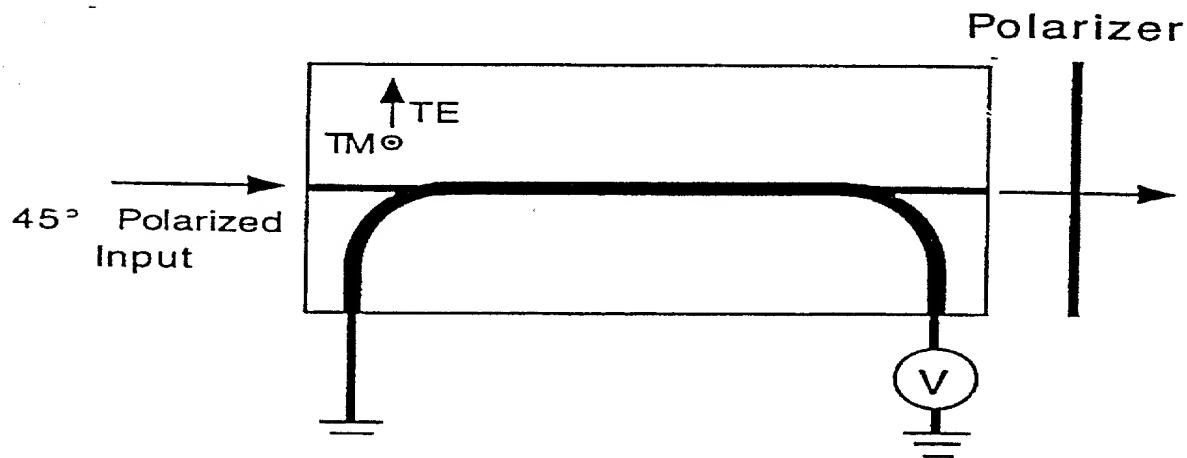


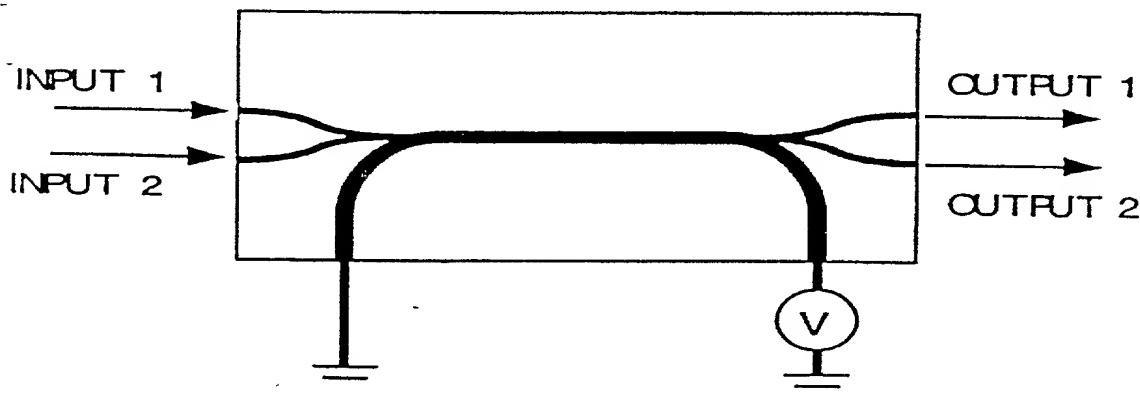
FIGURE 41



Mach Zehnder Modulator

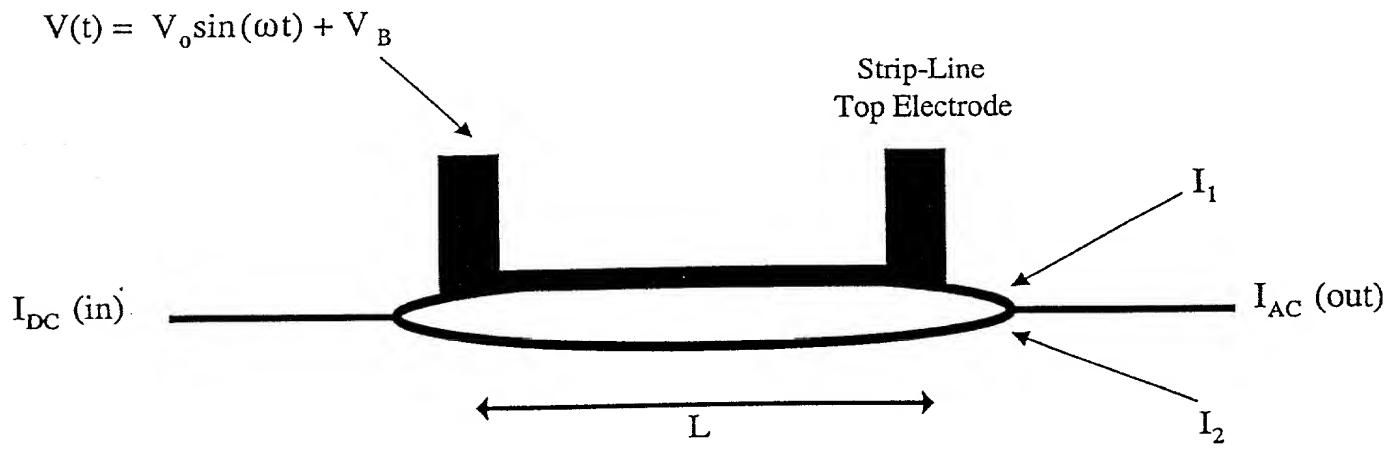


Birefringent Modulator



Directional Coupler

FIGURE 42



$$I_{AC} (\text{out}) = I_1 + I_2 + 2(I_1 I_2)^{1/2} \sin(\rho V_o \sin(\omega t))$$

$$\rho = 2\pi r_{33} n^3 L V_o / T \lambda$$

Comparison of key features of simple devices

Mach Zehnder Interferometer	Birefringent Modulator	Directional Coupler
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r_{eff}	r_{33}	$r_{33}-r_{13}$	r_{33}
V_π	$V_{\pi MZ}$	$1.5 V_{\pi MZ}$	$1.73 V_{\pi MZ}$
Mod. Power	P_{MZ}	$2.75 P_{MZ}$	$3 P_{MZ}$

FIGURE 43

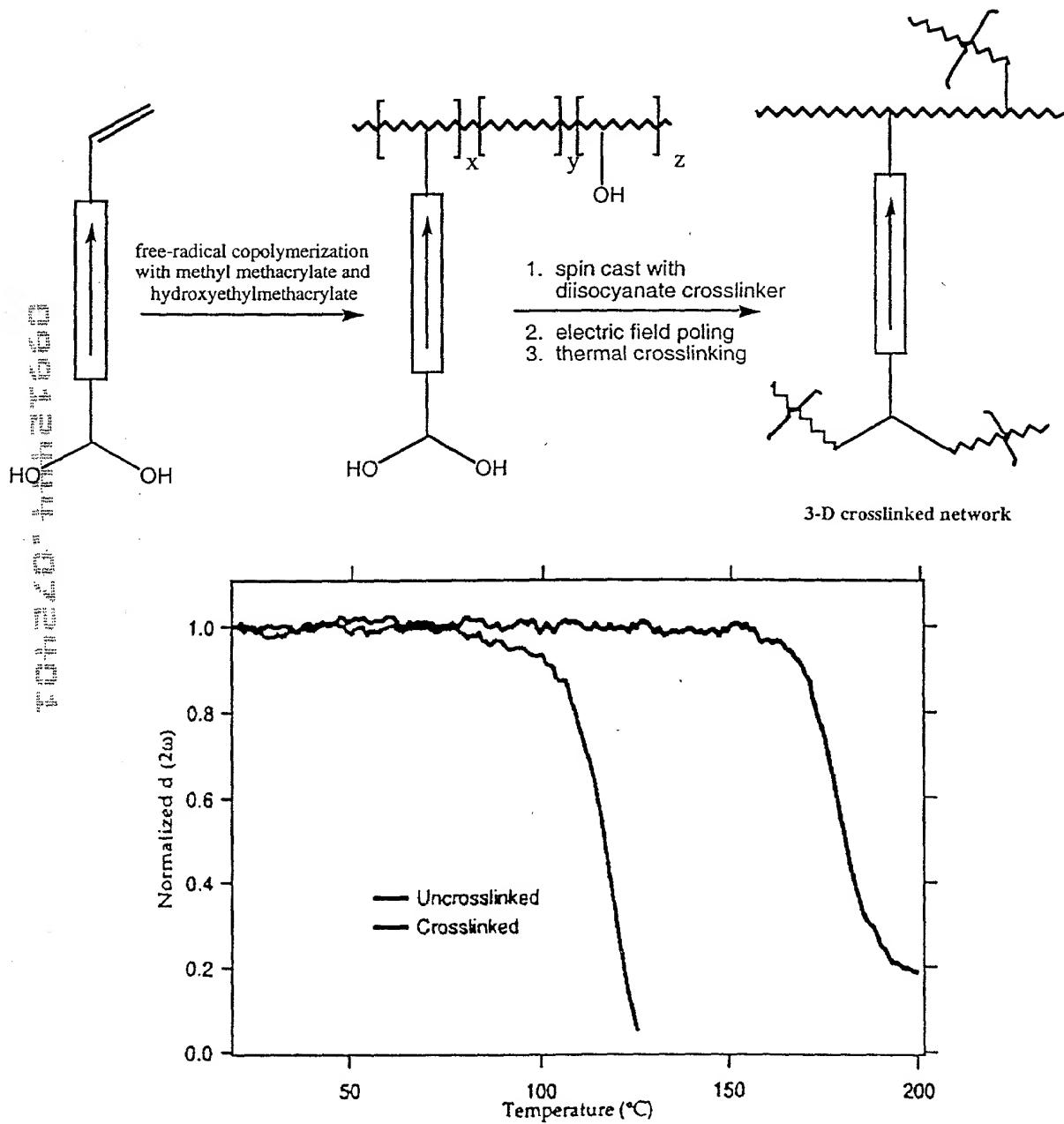


FIGURE 44

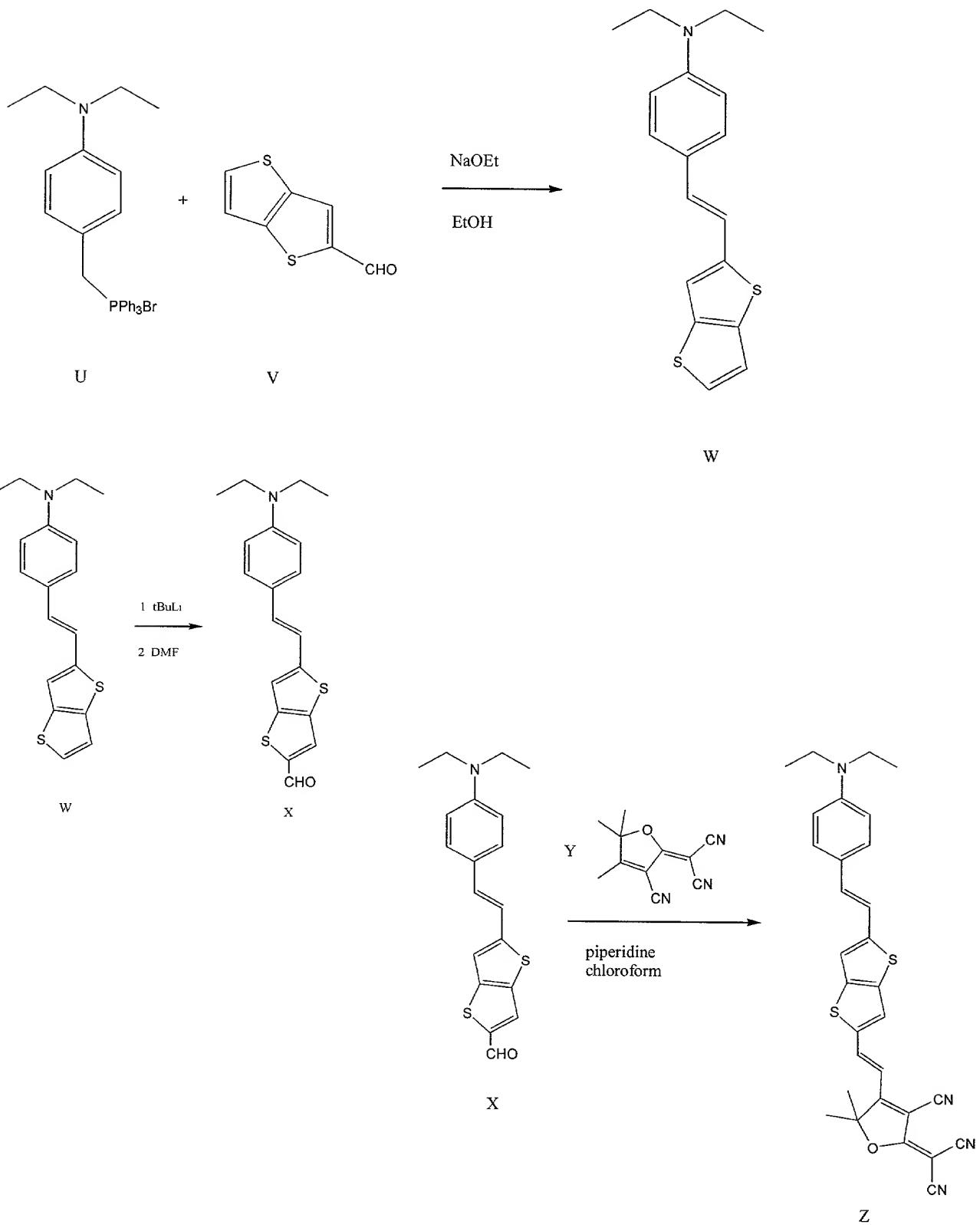


FIGURE 45

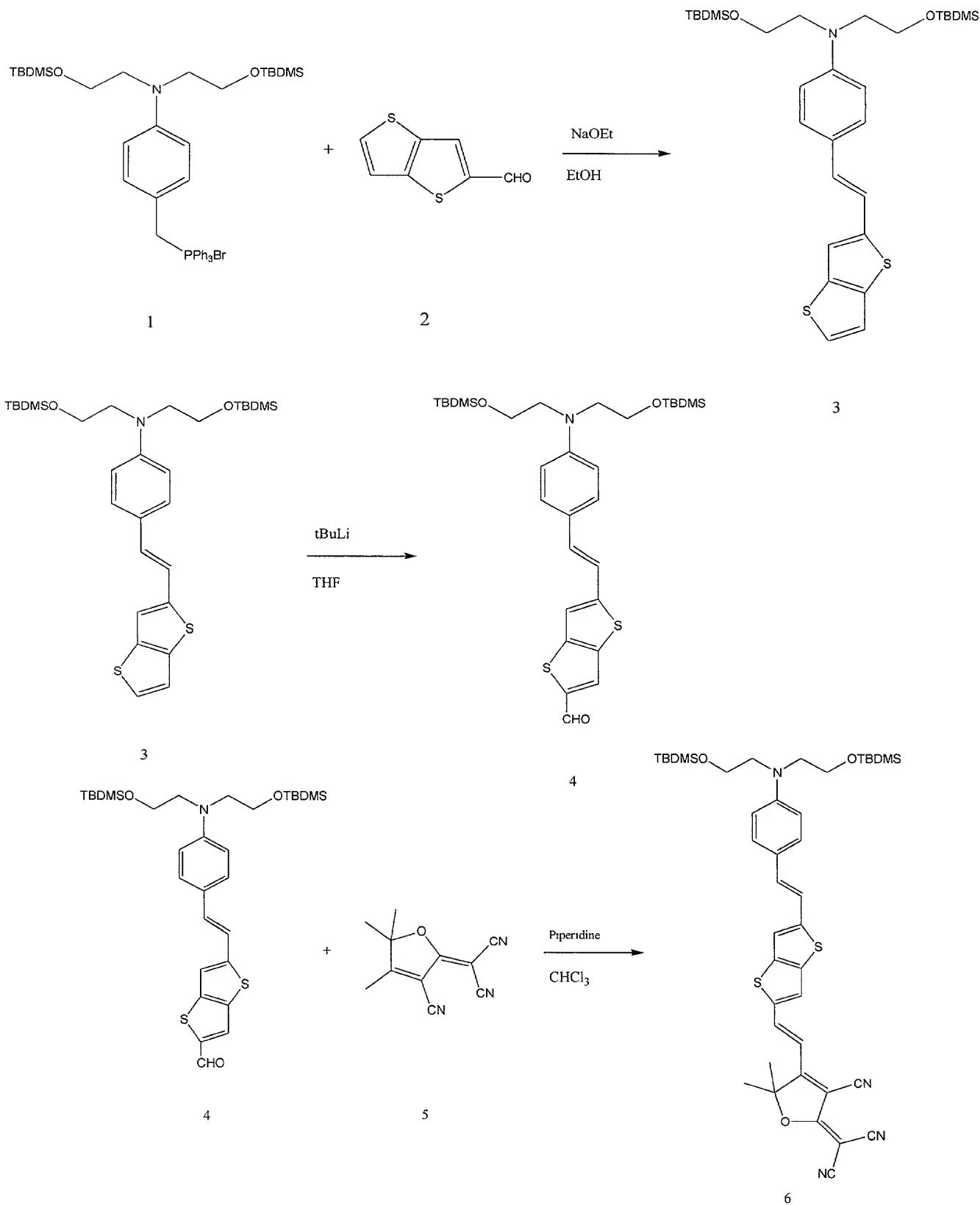


FIGURE 46

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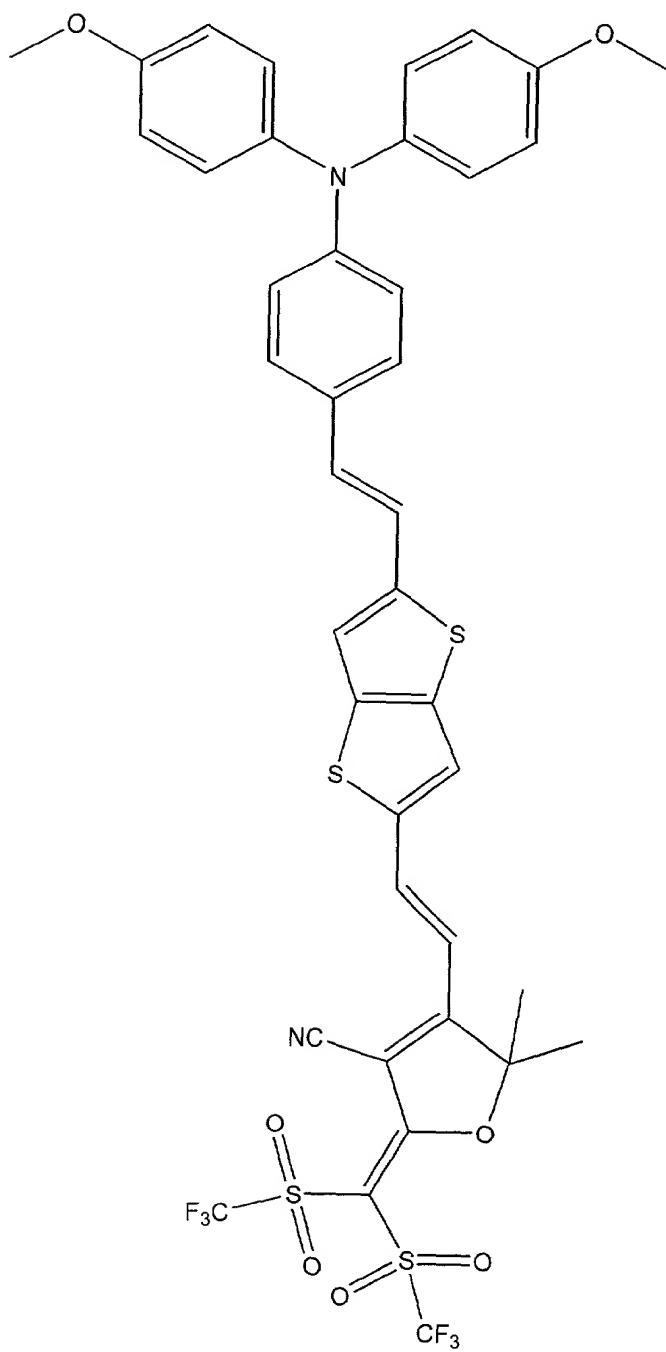


FIGURE 47

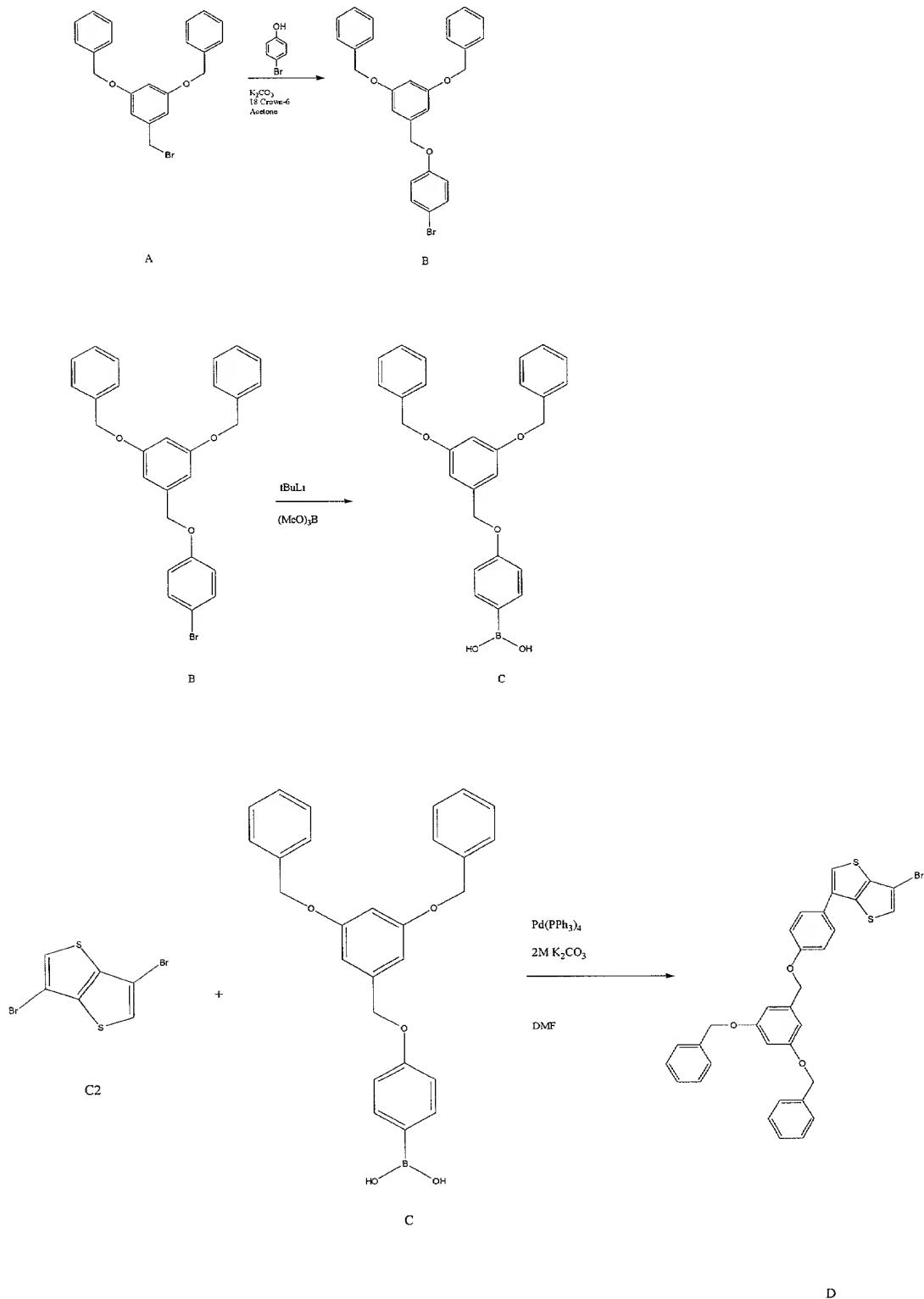


FIGURE 48